SPECIFICATIONS

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SPECIFICATIONS

DIVISION 1 - GENERAL REQUIREMENTS

SECTION 1.1 - GENERAL

1.1.1 THE REQUIREMENT

It is required that there be constructed and completed, in accordance with the contract provisions and clauses, these specifications, and the drawings listed in paragraph 7.1.1 (Drawings, General), hereof, Upgrading Mechanical Equipment, Central Section, Hoover Powerplant, Boulder Canyon Project, Arizona And Nevada.

The work is situated approximately 7 miles northeast of Boulder City, Nevada, on the Colorado River in Mohave County, Arizona and Clark County, Nevada.

1.1.2. DESCRIPTION OF THE WORK

The principal components of the work to be performed under these specifications include the following:

a. Central Section Powerhouse. -

(1) Removing and disposing of the existing jet pumps and eductors and associated equipment, including supply piping, intake piping, discharge piping, valves, wyes, metal supports and hangers, sump gate valves including guides and operators, float chambers, and tail pipes.

(2) Furnishing and installing piping, valves, and eductors and associated equipment, including the testing of the eductors and eductor control system, and core drilling for the piping for the 24-inch-diameter butterfly valves.

(3) Dismantling, cleaning, and repairing the following valves: the 24-inch-diameter galley drain plug valves; the 24-inch-diameter eductor discharge "Chapman" gate valves; the 24-inch-diameter eductor discharge check valves; and the 14-inch-diameter eductor high pressure supply check valves.

(4) Unwatering construction work areas.

(5) Removing steel support beams and furnishing and installing new steel support beams beneath the concrete floor at floor elevation 616.

(6) Removing existing gratings and covers as required for mechanical piping installation modifications.

(7) Furnishing and installing new miscellaneous metalwork.

1.1.3 SUBMITTAL REQUIREMENTS

a. General. - The Contractor shall furnish all materials and perform all work required for furnishing submittals to the Government, in accordance with the clause at FAR 52.236-21 "Specifications and Drawings for Construction", this paragraph, table 1A, and the requirements in the provisions, clauses, and paragraphs of this solicitation.

The word "submittals" shall be interpreted to include drawings, data, manuals, certifications, test report, curves, samples, color chips or charts, brochures, and other items furnished by the Contractor for approval, informational, or other purposes.

b. List of submittals. - Table 1A lists the submittals required by this solicitation except those submittals which are required conditionally or required by entities other than the Bureau of Reclamation. Any submittal required to be submitted by the Contractor, but which is not listed in the table, shall be submitted in accordance with the applicable requirements of this solicitation. In case of a conflict between the requirements of this paragraph and the requirements included elsewhere in this solicitation, the requirements elsewhere shall take precedence over the requirements contained in this paragraph.

c. Submittals. - Each item in Table 1A has been assigned an RSN (Required Submittal Number). The "Submittals required" column of the table specifies the material to be submitted for each RSN. All of the material specified for an RSN will be considered a complete set, and where the material required for an RSN is specified as separate or distinguishable parts, a complete set shall include all parts. Only complete sets shall be submitted.

The number of complete sets to be submitted, and the location to which they are to be mailed, shall be in accordance with the "No. of sets to be sent to:" column of the table, except as provided below for sets of original material.

When an RSN involves submittal of original (noncopied material, all original material, or as much thereof as is necessary to form a complete set, shall be included in just one complete set. This "originals" set shall be sent to the proper address, given in subparagraph e. below, as determined by the "Responsible code" column of the table and the following:

(1) CO indicates Contracting Officer.

(2) CE indicates Construction Engineer.

The "originals" set shall be counted as one of the complete sets required to be submitted under the "No. of sets to be mailed to:" column of the table.

For each RSN, the Contractor shall submit complete sets of required submittal material under the cover of a transmittal letter. At the Contractor's option, complete sets for

more than one RSN may be submitted under cover of the same transmittal letter, provided they have the same responsible code designation as shown in the table. The Contractor's transmittal letter shall include:

(1) Reference to Bureau of Reclamation contract number and title.

(2) Identification of responsible code as shown in the table.

(3) Complete list of RSN(s) for which material is being submitted.

(4) For each RSN, number of complete sets and list of materials included.

(5) For each RSN, identification of the submittal as an initial submittal or a resubmittal.

Each drawing submitted by the Contractor shall have the Contractor's or supplier's title and drawing number on it. Drawings and data shall be marked with the Bureau of Reclamation contract number and the RSN number.

Manufacturer's data for commercial products or equipment, such as catalog cut sheets, shall be clearly marked in a manner that will be evident when reproduced to indicate the item(s) to be furnished. The data shall be sufficiently comprehensive to identify the manufacturer's name, type, model, size, and characteristics of the product or equipment, as well as to fully demonstrate that the product or equipment meets the requirements of these specifications.

Submittals requiring certification by a registered professional shall be signed and sealed.

d. Review of submittals furnished for approval. - The time required for review of submittals or resubmittal furnished under an RSN for approval will not begin until the Government receives complete sets of all the submittal materials required for that particular RSN. The number of calendar days required for review of drawings or data submitted or resubmitted for approval will include the date the drawings or data are received by the Government, and will extend through the date of return mailing to the Contractor.

Except as otherwise provided in the specifications for specific submittals, the Government will require 40 calendar days for review of each submittal or resubmittal furnished by the Contractor for approval, and this review time will apply to each separate submittal or resubmittal whether the submittals are approved, not approved, or returned for revision.

If the Government uses time in excess of the specified number of calendar days for review of any submittal or resubmittal, additional time, not to exceed the excess time, will be added to the time allowed the Contractor for completion of the work affected by such excess time, to the extent it is demonstrated that the excess time caused delay. If the Government's review of two or more separate submittals or resubmittals is late and results in concurrent days of excess time, such days will be counted only once in computing an extension of the completion date. Further, if the Contractor fails to make

complete approval submittals in the sequence and within the time periods specified in this contract, and thus precludes the Government from approving or considering for approval such submittals within the specified calendar day period, then the Contractor shall not be entitled to an extension of time allowed for completion of the work.

Unless otherwise specified, one set of the submittals required for approval will be returned to the Contractor either approved, not approved, or conditionally approved, and also marked to indicate changes if required. Submittals that are not approved or that require changes or revisions shall be revised and resubmitted for approval, and shall show changes and revisions with revision date. All requirements specified for the initial submittal shall apply to any resubmittals required. Unless otherwise specified, all submittals which are to be resubmitted shall be resubmitted by the Contractor within 40 calendar days after the Contractor has received the Government's comments.

e. Addresses. - The Contractor shall submit the submittals to the applicable addresses listed below as required by table 1A.

The Contractor shall also send a copy of the transmittal letter to each of the addresses listed below that are not sent the submittal.

Submittals shall be submitted as required by table 1A to:

(1) Contracting Officer, Bureau of Reclamation, Attn: LC-3113, PO Box 61470, Boulder City NV 89006-1470.

(2) Construction Engineer, Bureau of Reclamation, Attn: LC2000, PO Box 60400, Boulder City NV 89006-0400.

f. Cost. - Unless otherwise specified, no separate payment will be made for preparing and furnishing submittals to the Government, and the cost thereof shall be included in the prices bid in the schedule for the applicable items of work requiring the submittals or other items of work.

Table 1A. - List of submittals

RSN	Item	Reference paragraph or clause	Respon-sible code	Submittals required	No. of sets to be mailed to:*		Due date or delivery time
					CO	CE	
C1	Bonds	52.228-15	CO	Performance and payment bonds	3	0	Within 15 calendar days after contract award.
C2	Construction schedule	52.236-15					
	(1) Practicable schedule		CE	Blackline prints	1	1	Within 5 days after work commences on the contract or another period of time as determined by the Contracting Officer

RSN	Item	Reference paragraph or clause	Respon-sible code	Submittals required	No. of sets to be mailed to:*		Due date or delivery time
					CO	CE	
	(2) Annotated schedule showing actual progress		CE	Blackline prints	1	1	As directed by the Contracting Officer
	(3) Supplementary schedule or schedules		CE	Blackline prints	1	1	As deemed necessary by the Contracting Officer
C3	Safety data	WBR 1452.223-900	CO	Experience Modification Rate for Worker's Compensation Insurance; Log and Summary of Occupational Injuries and Illnesses; death and lost workday severity incidence rate.	1	1	Within 20 calendar days from the date of receipt of notice of award
C4	Insurance - Work on a Government installation	52.228-5	CO	Written proof that the required insurance has been obtained	1	1	Before commencing work under this contract.
C5	Liability insurance	DOI 1452.228-70	CO	Acceptable evidence showing that insurance has been obtained	1	0	Before commencing work under this contract
C6	Accident prevention	52.236-13	CO	Accident exposure data	1	0	As prescribed by the Contracting Officer
C7	Payment (Electronic Funds Transfer)	52.232-28	CO	Payment information	1	0	After award, but not later than 14 days prior to submission of the first invoice
C8	Release of claims	DOI 1452.204-70	CO	Release of claims (DI-137) against United States	1	0	After completion of work and prior to final payment
C9	Equal opportunity	52.222-26	CO	Information required by Executive Order 11246 (SF 100)	1	0	Within 30 days following the award
C10	Subcontracts (Labor standards data)	52.222-11	CE	(1) List of sub-contractors (2)Statement and Acknowledgment Form (SF-1413)	0	1	Within 14 days after award of contract and within 14 days after award of any subcontract
C11	Safety	WBR 1452.223-81 1.4.2	CE	Proposed safety program	0	4	Prior to beginning any onsite work. See section 2 of Reclamation Safety and Health Standards.
C12	Hazardous materials	52.223-3 1.4.3	CE	Material safety data sheets	1	2	Not less than 45 days prior to jobsite delivery
C13	Unwatering Central Section Powerhouse	2.2.1	CE	Unwatering plan	0	2	At least 20 days prior to beginning any unwatering work

RSN	Item	Reference paragraph or clause	Respon-sible code	Submittals required	No. of sets to be mailed to:*		Due date or delivery time
					CO	CE	
C14	Structural steel	4.1.1	CE	(1) Approval drawings	0	3	At least 40 days before proceeding with fabrication or procurement
				(2) Installation plan	0	3	At least 40 days before proceeding with fabrication or procurement
				(3) Final drawings	0	2	Within 40 days before shipment of materials to site
M1	Bulkhead	5.2.1.b	CE	Detail	0	2	10 days prior to bulkhead installation
M2	(1) Flange insulation	5.3.1.b.(1)(a)	CE	Commercial products data	0	5	Before fabrication or procurement
	(2) Butterfly valves	5.3.1.b.(1)(a)		Commercial products data	0	5	Before fabrication or procurement
	(3) Gate valves	5.3.1.b.(1)(a)		Commercial products data	0	5	Before fabrication or procurement
	(4) Ball valves for eductor supply piping	5.3.1.b.(1)(a)		Commercial products data	0	5	Before fabrication or procurement
	(5) Ball valves for air valve assemblies	5.3.1.b.(1)(a)		Commercial products data	0	5	Before fabrication or procurement
	(6) Check valves	5.3.1.b.(1)(a)		Commercial products data	0	5	Before fabrication or procurement
	(7) Air valves	5.3.1.b.(1)(a)		Commercial products data	0	5	Before fabrication or procurement
	(8) Eductors	5.3.1.b.(1)(a)		(1) Commercial products data	0	5	Before fabrication or procurement
				(2) Test procedures	0	5	Before conducting scale model tests
	(9) Pneumatic control system:	5.3.1.b.(1)(a)					
	(a) Pressure tank	5.3.1.b.(1)(a)		Commercial products data	0	5	Before fabrication or procurement
	(b) Filter regulator	5.3.1.b.(1)(a)		Commercial products data	0	5	Before fabrication or procurement
	(c) Pilot-operated four-way valve	5.3.1.b.(1)(a)		Commercial products data	0	5	Before fabrication or procurement
	(d) Pilot-operated two-way valve	5.3.1.b.(1)(a)		Commercial products data	0	5	Before fabrication or procurement
	(e) Palm button-operated three-way valve	5.3.1.b.(1)(a)		Commercial products data	0	5	Before fabrication or procurement

RSN	Item	Reference paragraph or clause	Respon-sible code	Submittals required	No. of sets to be mailed to:*		Due date or delivery time
					CO	CE	
	(f) Shuttle valve	5.3.1.b.(1)(a)		Commercial products data	0	5	Before fabrication or procurement
	(g) Pressure gauges	5.3.1.b.(1)(a)		Commercial products data	0	5	Before fabrication or procurement
	(10) Piping for the eductors	5.3.1.b.(1)(b)		Shop drawings	0	5	Before fabrication or procurement
M3	(1) Butterfly valves	5.3.1. b.(2)(a)	CE	Service manuals	0	5	Before shipment
	(2) Gate valves	5.3.1. b.(2)(a)		Service manuals	0	5	Before shipment
	(3) Ball valves for eductor supply piping	5.3.1. b.(2)(a)		Service manuals	0	5	Before shipment
	(4) Ball valves for air valve assemblies	5.3.1. b.(2)(a)		Service manuals	0	5	Before shipment
	(5) Check valves	5.3.1. b.(2)(a)		Service manuals	0	5	Before shipment
	(6) Air valves	5.3.1. b.(2)(a)		Service manuals	0	5	Before shipment
	(7) Eductors	5.3.1.b.(2)(b)		Final drawings	0	5	After installation is complete
	(8) Pneumatic control system:						
	(a) Pressure tank	5.3.1. b.(2)(a)		Service manuals - include previously approved data and maintenance information for commercial equipment	0	5	Before shipment
	(b) Filter regulator	5.3.1. b.(2)(a)			0	5	Before shipment
	(c) Pilot-operated four-way valve	5.3.1. b.(2)(a)			0	5	Before shipment
	(d) Pilot-operated two-way valve	5.3.1. b.(2)(a)			0	5	Before shipment
	(e) Palm button-operated three-way valve	5.3.1. b.(2)(a)			0	5	Before shipment
	(f) Shuttle valve	5.3.1. b.(2)(a)			0	5	Before shipment
	(g) Pressure gauges	5.3.1. b.(2)(a)			0	5	Before shipment
	(9) Piping for the eductors	5.3.1. b.(2)(b)		Final drawings	0	5	After installation is complete
	(10) Eductor	5.3.1.b.(2)(c)		Test procedures	0	5	Prior to inductor testing
M4	(1) Globe valves	5.3.2 .b.(1)(a)	CE	Commercial products data	0	5	Before fabrication or procurement
	(2) Ball valves	5.3.2 .b.(1)(a)		Commercial products data	0	5	Before fabrication or procurement

RSN	Item	Reference paragraph or clause	Respon-sible code	Submittals required	No. of sets to be mailed to:*		Due date or delivery time
					CO	CE	
M5	(1) Globe valves	5.3.2.b.(2)(a)	CE	Service manuals	0	5	Before shipment
	(2) Ball valves	5.3.2 .b.(2)(a)		Service manuals	0	5	Before shipment
	(3) Steel piping for the jet-flow gate installations	5.3.2 .b.(2)(b)		Final drawings	0	5	After installation is complete
RSC 1	Paint and coating materials	6.1.1.b(2)	CE	Purchase orders, certifications, paint manufacturer's composition data, and samples	0	1	Not less than 45 days prior to use of the associated paint and coating materials
RSC 2	Coating Applicator Qualifications	6.1.1.b(2)(e)	CE	Written evidence that each coating applicator meets the special standards of responsibility	0	1	Not less that 45 days prior to use of the associated paint and coating materials

*CO indicates Contracting Officer, CE indicates Construction Engineer. For mailing addresses, see subparagraph entitled "Addresses" of paragraph entitled "Submittal Requirements."

1.1.4 EQUIPMENT AND METALWORK

a. General. - Except as otherwise provided in these specifications, the installation of equipment and metalwork shall be in accordance with the requirements of this paragraph.

b. Repair of damaged materials. - Damaged or defective materials shall not be installed.

Damaged or defective surfaces or areas of paint, galvanizing, or coating shall be cleaned and repaired in accordance with paragraph 6.1.1 (Painting and Coating, General).

c. Installation. - Special care shall be taken to ensure that all parts are installed in correct position and alignment. Operating equipment shall be carefully and accurately installed and shall be adjusted so that all parts will operate smoothly and function properly.

All couplings and flange faces shall be cleaned thoroughly of all dirt and burrs before connection to ensure correct fit and true alignment. Unless otherwise specified, gaskets shall be placed in flanged joints of piping, and pipe flange bolts shall be tightened so that the joint will not leak. All piping shall be cleaned prior to assembly and tested for leaks before being placed in service.

Installation of equipment shall include connecting to piping systems.

Metalwork to be embedded in concrete shall be located accurately, and shall be held in correct position and alignment and protected from damage and displacement during placing and setting of the concrete. Unless specified otherwise, all braces, supports, and other items used to position and align embedded metalwork, which will also be embedded in

concrete, shall be metal. No wooden braces, supports, or other items used to position and align metalwork shall be embedded in concrete.

Where it is impracticable to embed anchor bolts or anchors for the installation of ladders, stairways, or other comparatively light metalwork before the concrete is placed, and when it is necessary to anchor parts where inserts or anchor bolts have not been provided, holes shall be drilled in the concrete and expansion anchors shall be installed as approved. All holes for expansion anchors shall be straight and true to the diameter recommended by the manufacturer of the expansion anchors. The Contractor shall use diamond bits, or equal, to achieve true holes such that expansion anchors fit securely. Holes shall be core drilled where called for on the drawings. If drilling water is used, surfaces of concrete to remain exposed shall be cleaned immediately so as to prevent discoloration of the concrete by the drilling water and cuttings.

The surfaces of all metalwork to be in contact with or embedded in concrete or grouting mortar shall be cleaned in accordance with paragraph 6.1.1 (Painting and Coating, General).

Equipment and bases or supports and baseplates shall be leveled and aligned carefully, adjusted to correct alignment and grade with steel shims as necessary, and rigidly secured in place. Unless otherwise shown on the drawings or required by these specifications, all steel shims shall be left in place.

Where shown on the drawings or required by these specifications, all spaces under the equipment, bases, or supports shall be filled completely as required with grouting mortar in accordance with paragraph 3.1.1 (Grouting Mortar For Equipment and Metalwork).

d. Cost. - Except as otherwise provided in these specifications, the cost of work required by this paragraph including the costs of assembling; erecting; supporting, servicing, and adjusting; cleaning; painting, coating, repairing of paint, galvanizing, or coatings; drilling holes; making all required connections; performing required tests; and maintaining installed equipment and metalwork in proper condition until acceptance shall be included in the applicable prices bid in the schedule for furnishing and installing the equipment and metalwork.

SECTION 1.2 - MATERIALS

1.2.1 MATERIALS TO BE FURNISHED BY THE CONTRACTOR

a. General. - The Contractor shall furnish all materials required for completion of the work.

The words "material" or "materials" as used in these specifications to denote items furnished by the Contractor shall be construed to mean equipment, machinery, product, component, or any other item required to be incorporated in the work.

When a separate item which includes the furnishing of any material is provided in the schedule, the cost of furnishing, hauling, storing, and handling shall be included in the price bid for that item. When a separate item is not provided in the schedule for furnishing any material required to be furnished by the Contractor, the cost of furnishing, hauling, storing, and handling shall be included in the price bid for the work for which the material is required.

Materials furnished by the Contractor shall be of the type and quality described in these specifications. The Contractor shall make diligent effort to procure the specified materials from any and all sources, but where because of Government priorities or other causes, materials required by these specifications become unavailable, substitute materials may be used: Provided, that no substitute materials shall be used without prior written approval of the Contracting Officer, said written approval to state the amount of the adjustment, if any, to be made in favor of the Government. The Contracting Officer's determination as to whether substitution shall be permitted and as to what substitute materials may be used shall be final and conclusive. If the substitute materials approved are of less value to the Government or involve less cost to the Contractor than the materials specified, an adjustment shall be made in favor of the Government, and where the amount involved or the importance of the substitution warrants, a deductive modification to the contract will be issued. No payments in excess of prices bid in the schedule will be made because of substitution of one material for another or because of the use of one alternate material in place of another.

b. Inspection of materials. - Materials furnished by the Contractor which will become a part of the completed construction work shall be subject to inspection in accordance with clauses entitled "Materials and Workmanship" and "Inspection of Construction" at any one or more of the following locations, as determined by the Contracting Officer: at the place of production or manufacture, at the shipping point, or at the site of the work. To allow sufficient time to provide for inspection, the Contractor shall submit to the Contracting Officer, at the time of issuance, copies in triplicate of purchase orders, including drawings and other pertinent information, covering materials on which inspection will be made as advised by the Contracting Officer, or shall submit other evidence in the event such purchase orders are issued verbally or by letter.

The inspection of materials at any of the locations specified above or the waiving of the inspection thereof shall not be construed as being conclusive as to whether the materials and equipment conform to the contract requirements under the clause entitled "Inspection of Construction," nor shall the Contractor be relieved thereby of the responsibility for furnishing materials meeting the requirements of these specifications. Acceptance of all materials will be made only at the site of the work.

1.2.2 MATERIALS AND WORKMANSHIP - RECLAMATION

As stated in the clause entitled "Material and Workmanship," equipment to be furnished by the Contractor shall be of the most suitable grade for the purpose intended. The Contractor shall be responsible for the accurate manufacture and fabrication of the equipment in accordance with the best modern practice and the requirements of these specifications notwithstanding minor errors or omissions therefrom.

Liberal factors of safety and adequate shock-absorbing features shall be used throughout the designs and especially in the design of all parts subject to variable stresses or shock, including alternating- and vibrating-type stresses and shock. Shock-absorbing features and parts subject to vibration shall include provisions which prevent components from loosening.

Unless otherwise specified, materials used in the manufacture of the equipment shall conform to applicable Federal Specifications or Federal Standards, and if there are no applicable Federal Specifications or Federal Standards, shall conform to the applicable specifications of the American Society for Testing and Materials, the Society of Automotive Engineers, or the American National Standards Institute. If the Contractor for justifiable cause proposes to deviate from or to use materials not covered by the Federal Specifications or Federal Standards, the Contractor shall state the reasons for and exact nature of the deviation and shall submit for the approval of the Contracting Officer complete specifications for the materials that the Contractor proposes to use.

Parts shall be made accurately to standard gauge where possible so as to facilitate replacement and repair. Bolts, nuts, screws, taps, pipes, and pipefittings shall be unified screw threads conforming to ANSI/ASME B1.1 and B1.20.1. For internal connections of individual items of equipment only, the Contractor will be permitted to deviate from the ANSI/ASME standards: Provided, That the Contractor furnishes a complete set of all such necessary taps and dies which might be required by the Government to facilitate repair or replacement.

1.2.3 REFERENCE SPECIFICATIONS AND STANDARDS

Materials, Contractor design, construction work, and other requirements which are specified by reference to Federal Specifications, Federal Standards, or other standards, specifications, or codes shall be in compliance with the editions or revisions listed in WBR 1452.211-81, Effective Dates of Referenced Specifications and Standards. If a more recent specification or standard is found to be in effect other than the one listed in WBR 1452.211-81, the Contractor shall notify the Contracting Officer. In the event of conflicting requirements between a referenced specification, standard, or code and these specifications, these specifications shall govern.

Unless otherwise specified, all materials that will become a part of the completed work shall be new and shall conform to the Federal or other specifications and standards referred to herein. Where reference specifications numbers are designated throughout these specifications, they refer to Federal Specifications unless otherwise noted. In the event that the materials are not covered by Federal or other specifications, the materials furnished shall be of standard commercial quality. Where types, grades, or other options listed in the reference specifications are not specified in these specifications, the material furnished will be acceptable if it is in accordance with any one of the types, grades, or options listed in the reference specifications.

Copies of many of the Federal Specifications and Standards may be examined at the office of the Bureau of Reclamation, Denver Office, Building 67, Denver Federal Center, West Sixth Avenue and Kipling Street, Denver, Colorado. Single copies of Federal Specifications and standards may be obtained without charge from any one of the General Services Administration Business Service Centers. See the provision entitled "Availability of Specifications Listed in the GSA Index of Federal Specifications, Standards and Commercial Item Descriptions."

Bureau of Reclamation Specifications and Standards may be obtained from the Bureau of Reclamation, Attn: D-8170, PO Box 25007, Denver CO 80225. This address may also be used to order the various manuals and standard specifications printed, reprinted, or published while the Bureau of Reclamation was officially named the Water and Power Resources Service. All references to Water and Power Resources Service or any form derivative thereof shall be considered synonymous with the Bureau of Reclamation.

Addresses for obtaining some industrial and governmental (other than Federal and Bureau of Reclamation specifications and standards) specifications, standards, and codes are listed in the provision entitled "Availability of Specifications Not Listed in the GSA Index of Federal Specifications, Standards and Commercial Item Descriptions."

The Contractor shall maintain onsite, a copy of all specifications, standards, codes, manuals, and other documents that are referenced in these specifications and that are pertinent to the materials being installed or work proceeding at that time. These shall be available for use by the Contracting Officer and the Contracting Officer's representatives.

In accordance with the clause entitled "Material and Workmanship," the references to materials, wherein manufacturer's products or brands are specified by "brand name or equal" purchase descriptions, are made as standards of comparison only as to type, design, character, or quality of the article required, and do not restrict bidders or the Contractor to the manufacturer's products or to the specific brands named. It shall be the responsibility of the Contractor to prove equality of materials and products to those referenced and to provide all descriptive information, test results, and other evidence as may be necessary to prove the equality of materials or products which the Contractor offers as being equal to those referenced.

1.2.4 WEIGHTS OF METAL PARTS

The weights of metalwork, metal pipe, reinforcing steel, and other metal parts, the furnishing, installing, handling, or placing of which is to be paid for on the basis of weight, will be determined by the Contracting Officer. The Government will not provide scales for actually weighing all of the material, but the Contracting Officer will determine the weight of each part or item involved in the most practicable manner and will use for this purpose railroad shipping weights, manufacturer's weights, catalog weights, and estimated weights, subject to the requirements of the clause entitled "Disputes" in case of dispute.

Net weights only will be paid for and the weight of all tare, packing, and blocking will be deducted. Weights of mortar or grout, shims, wedges, lead and other caulking materials, gaskets, oil, grease, welds, paint, coating materials, joint materials other than bolts, nuts, and washers, and similar materials as are required to be applied at the site of construction, will not be included in the weights for which payment is made. Regardless of whether applied at the fabricating plant or at the site of construction, protective

wrappings, mortar or concrete coating or lining, and bituminous or coal-tar coating or lining also will not be included in the weights for which payment is made.

SECTION 1.3 - LOCAL CONDITIONS

1.3.1. INVESTIGATION OF SITE CONDITIONS

It is recommended that a visit to the site of the work be made prior to preparing a bid, to perform investigations as to the existing conditions affecting the work to be done under these specifications. If the Contractor chooses not to visit the site or conduct investigations, it will nevertheless be charged with knowledge of conditions which reasonable inspection and investigations would have disclosed.

Access to the work sites is limited and conditions at the site will affect the Contractor's operations.

Prospective bidders and the Contractor shall assume all responsibility for deductions and conclusions as to the difficulties in performing the work.

1.3.2. ACCESS TO THE WORK AND HAUL ROUTE

a. General.--Contractor access to the powerhouse will be via the Lower Portal Road off Highway 93 from the Nevada side of the dam.

The Contractor shall make its own investigation of the condition of available public or private roads and of clearances, restrictions, bridge-load limits, bond requirements, and other limitations that affect or may affect transportation and ingress and egress at the jobsite. Subject to the contract clause entitled "Default (Fixed-Price Construction)", the unavailability of transportation facilities or limitations thereon shall not become a basis for claims for damages or extension of time for completion of work.

b. Existing roads.--Existing roads are available for the Contractor's use subject to existing restrictions. The Contractor shall meet all conditions properly imposed upon the use of existing roads by those having jurisdiction thereover, including (without limitation of the generality of the foregoing) seasonal or other limitations or restrictions, the payment of excess size and weight fees, and the posting of bonds conditioned upon repair of road damage caused by the Contractor.

c. Haul routes.--The hauling of construction materials or waste materials over public highways, roads, or bridges shall be in compliance with the applicable local regulations and shall be such as to minimize interference with or congestion of local traffic. Where haul routes cross public highways or roads, the Contractor shall provide barricades, flagmen, and other necessary precautions for safety of the public as provided in Paragraph 1.4.1 (Safety of the Public).

d. Parking.--Parking is extremely limited in the powerplant area, and the Contractor will be restricted to the use of two parking spaces. The types of vehicles that may be parked in this area will be subject to the approval of the Construction Engineer. The Contractor shall place an identification label, with the Contractor's name, on the windshield of vehicles parked in the powerplant area. This will not be required if the

Contractor's name is prominently displayed at some other location on the vehicle. Vehicles parked in the powerplant area shall be left unlocked with keys in the ignition.

e. Cost.--The cost of all work described in this paragraph shall be included in the prices bid in the schedule for other items of work.

1.3.3. SECURITY AND IDENTIFICATION OF EMPLOYEES

The operation of Hoover Dam and Powerplant requires continuous and effective security measures. Such security is carried out by a Federal guard system, and the security regulations provide for controlled access to certain restricted areas including the switchyards, powerplant, and other critical areas. These restricted areas are designated by and may be modified or changed by the Government. The Contractor shall be responsible for initiating necessary measures to ensure that its employees comply with all established security rules and regulations, including, but not restricted to, the following:

(1) Construction work areas.--All areas where work is required under this contract are designated as construction work areas. The Contracting Officer will designate suitable accessways to construction work areas for use of construction personnel. Unless specifically authorized, construction personnel shall be restricted to these areas. It shall be the Contractor's responsibility to ensure, by appropriate and effective means, that its personnel remain in these areas while on the jobsite.

(2) Restricted areas.--Construction personnel shall not be permitted to enter established or designated restricted areas unless so authorized by the Contracting Officer. Such entry shall be in accordance with, and subject to, the security regulations established for the area. It shall be the Contractor's responsibility to ensure, by appropriate and effective means, that its personnel shall not enter these areas unless authorized as herein specified.

(3) Identification of Contractor employees.--Should Contractor personnel require access into secured areas, these personnel will be issued numbered identification badges clearly identifying the employee and its employer. Identification will include photographs. Such identification shall be required for all employees on the jobsite and badges shall be worn at all times in plain sight. Badges will be furnished by the Government.

Initial issuance of badges will be made at no cost to the Contractor; however, the cost of replacement badges shall be borne by the Contractor. All badges must be returned to the Contracting Officer upon completion of the work.

1.3.4. USE OF LAND FOR CONSTRUCTION PURPOSES

a. General.--The Contractor will be permitted to use Government land, controlled by the Bureau of Reclamation, for field offices, construction plants and buildings, storage yards, shops, roads, spoil areas, and other construction facilities required for construction purposes.

If private land is used for construction facilities, or other construction purposes, the Contractor shall make all necessary arrangements and shall pay all rental and other costs associated therewith.

b. Government land.--The Contractor's use of Government land for construction purposes shall be subject to the requirements of the contract clauses entitled "Operations and Storage Areas," "Protection of Existing Vegetation, Structures, Equipment, Utilities, and Improvements," "Cleaning Up," and other applicable contract clauses, SECTION 1.5 - ENVIRONMENTAL QUALITY PROTECTION of these specifications, and to the requirements of this paragraph. Such use shall not interfere with any part of the work under this contract, nor with the work of other contractors or the Government in the vicinity, nor with reservations made, or as may be made, by the Government for the use of such land.

Housing for Contractor personnel will not be permitted on Government land, except housing for guards or watchmen as may be approved by the Contracting Officer.

c. Cost.-- No charge will be made to the Contractor for the use of Government land for construction purposes. In accordance with the contract clause entitled "Operations and Storage Areas" all work required by this paragraph shall be at the expense of the Contractor.

1.3.5 MAINTAINING PEDESTRIAN AND PUBLIC VEHICULAR TRAFFIC

The Contractor shall make all necessary provisions for maintaining the flow of public traffic and shall conduct the Contractor's operations so as to offer the least possible obstruction and inconvenience to public traffic.

Convenient access to buildings along the line of the work shall be maintained, and temporary approaches to crossings or intersecting roads shall be provided and kept in good condition. Public traffic shall be permitted to cross over and pass through construction operations at all times with as little inconvenience and delay as possible and the Contractor shall, when directed, provide and station competent flagmen whose sole duties shall consist of directing and controlling the movement of public traffic either through or around the work.

Where public traffic will be required to pass through the work, construction operations shall be conducted so as to provide a reasonably smooth and unobstructed passageway for two lanes of traffic at all times excepted as noted below. At any and all points along the work where the nature of the construction operations in progress and the equipment and machinery in use are of such character as to endanger passing traffic, the Contractor shall provide such guards as may be necessary to ensure against accidents and avoid damage or injury to passing traffic.

The cost of all work involved in maintaining pedestrian and public vehicular traffic, as described in this paragraph, shall be included in the prices bid in the schedule for other items of work.

1.3.6. PROTECTION OF EXISTING INSTALLATIONS

a. General.--In performing work at the existing dam and powerplant, the Contractor shall take all necessary precautions to safeguard existing installations. The Contractor shall obtain the locations of embedded conduit, piping, cable, and other embedded items before performing any drilling or cutting of concrete, and shall protect adjacent installations during its construction operations.

The Contractor shall furnish, install and maintain adequate protection as needed to safeguard personnel and existing facilities from harm due to the Contractor's operations. Such protection shall be subject to approval of the Contracting Officer.

All protective installations shall be arranged so as to permit operation of the existing equipment and facilities by the Government while work under these specifications is in progress. The Contractor shall remove all protective installations which it has provided after they have served their purpose. The materials furnished by the Contractor to provide protection shall remain the property of the Contractor, and after removal, shall be transported from the worksite.

The Contractor shall not discharge anything but clean water into the drainage system, see paragraph 1.5.2 (Prevention of Water Pollution).

b. Enclosures shall be constructed by the Contractor to prevent dust, spills, chips, grit and other foreign material from endangering personnel and contaminating or damaging equipment during construction operations.

Enclosures shall be subject to the approval of the Contracting Officer. Enclosures shall be sufficient to confine the Contractor's operations to the immediate work area, and to prevent contaminating and damaging mechanical installations.

c. Damages.--The Contractor shall repair, at the Contractor's expense, any damage to existing installations due to the Contractor's operations or the Contractor's failure to provide proper protection; or at the option of the Contracting Officer, any such damage may be repaired by the Government, and the Contractor will be backcharged for the cost thereof.

d. Cost.--The cost of all protection, as described in these specifications, including furnishing all necessary materials and constructing and removing protective installations shall be included in the applicable prices bid in the schedule for which the protection is required.

1.3.7. GOVERNMENT-FURNISHED SANITARY AND COMPRESSED AIR FACILITIES

The following facilities will be available to the Contractor at no charge for use in the performance of work under these specifications:

1. Sanitary facilities. - Existing restrooms are located near the entrance to the upper penstock adits in Arizona and Nevada and will be made available to the Contractor.

2. Compressed air facilities. - Compressed air is available at approximately 60-100 pounds per square inch from service outlets at the Central Section Powerhouse. The Contractor shall provide, at its own expense, any lines and connections for the Contractor's use of compressed air. The Contractor shall remove all temporary hookups for use of compressed air upon completion of the work. No waste of Government-supplied compressed air will be permitted.

The location of these facilities will be shown during pre-bid site visits or after award of the contract. Facilities are provided on an as-is, where-found basis.

Electric power and water for construction purposes are provided for in paragraphs 1.3.9 (Electric Power For Construction Purposes) and 1.3.10 (Water For Construction Purposes).

The cost of providing necessary materials and labor for conveying compressed air to points of use shall be included in the prices bid in the schedule for other items of work.

1.3.8 USE OF EXISTING GOVERNMENT CRANES

Government equipment as defined below, that are located at the jobsite, will be operated by Government personnel. The Government will remain responsible for the normal maintenance responsibilities for Government equipment.

The Central Section Powerhouse, third floor, 50-ton shop crane will be available to the Contractor for use. The operation of the crane will be performed by a Government employee. The cost to the Contractor for use of the crane will be $75 per hour which will include one operator. The Contractor will be responsible for all rigging of the loads. There will be a minimum 2 hour charge for each time the Contractor requests the use of the crane.

Payment to the Government by the contractor for use of the Government equipment shall be made by showing a credit to the Government on each progress payment request of the total payment due the Government for the Contractor's use of the Government equipment during the period for which the progress payment is being requested. The total amount due the Government shall be agreed upon by both parties prior to including the credit on the request for progress payment. A final adjustment to the contract price reflecting the total amount credited to the Government for use of Government equipment will be accomplished by modification to the contract at the completion of the contract performance period.

The Bureau of Reclamation and other contractors use the Central Section Powerhouse crane. Therefore, requests for use of this equipment shall be made to the Construction Engineer in writing at least 48 hours prior to each scheduled time of use. The use of the 50-ton crane are restricted to the hours between 7:00 a.m. to 4:00 p.m., Monday through Thursday.

The Contractor shall be responsible for providing all materials necessary to safely rig each load for the cranes described above whether the cranes are operated by the Government or Contractor.

1.3.9 ELECTRIC POWER FOR CONSTRUCTION PURPOSES

Electric power up to a maximum of approximately 25 kilovolt amperes for construction work to be performed under these specifications will be available to the Contractor. The location of the Government-supplied power source will be showing during prebid site visits or after contract award.

The Contractor may, at the Contractor's option, furnish power for its operations by other means. If the Contractor elects to use power made available by the Government, this power will be delivered to the Contractor as 3-phase, 60 hertz, alternating current at approximately 480 volts and single phase, 60 hertz, alternating current at approximately 120 volts.

The Contractor shall provide all necessary distribution circuits, transformers, and other electrical equipment required for distributing the power to the place or places of use by the Contractor.

1.3.10 WATER FOR CONSTRUCTION PURPOSES

The Contractor shall provide all facilities for obtaining water and shall transport water to the points of use.

Water for construction is available at service outlets at various locations throughout the project.

The cost of providing necessary facilities and conveying water to points of use shall be included in the prices bid in the schedule for other items of work.

SECTION 1.4 - SAFETY

1.4.1 SAFETY OF THE PUBLIC

Roads and pedestrian walkways subject to interference by the work shall be kept open or suitable temporary passages through the work shall be provided and maintained by the Contractor. The Contractor shall provide, erect, and maintain all necessary barricades, suitable and sufficient flasher lights, flagmen, danger signals, and signs, and shall take all necessary precautions for the protection of the work and the safety of the public.

The cost of complying with this paragraph shall be included in the prices bid in the schedule for other items of work.

1.4.2 SAFETY AND HEALTH REQUIREMENTS

a. The Contractor shall not require any laborer or mechanic employed in the performance of the contract to work under conditions which are unsanitary, hazardous, or dangerous to the laborer's or mechanic's health or safety, as determined under Construction Safety and Health Standards promulgated by the Secretary of Labor under section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 327 et seq.), as amended, and "Reclamation Safety and Health Standards," published by the Bureau of Reclamation.

b. The Contractor shall fully comply with Reclamation's "Reclamation Safety and Health Standards" and amendments or revisions thereto in effect on the date bids are received. Copies are available from the National Technical Information Service (NTIS). Information regarding availability and pricing may be obtained by contacting NTIS at the following address:

United States Department of Commerce
National Technical Information Service
5285 Port Royal Road
Springfield, Virginia 22161
Telephone: (703) 487-4650 or 1-800-553-6847

Construction Safety and Health Standards promulgated by the Secretary of Labor may be obtained from any regional or area office of the Occupational Safety and Health Administration of the U.S. Department of Labor.

c. The Contractor shall submit in writing a proposed safety program in the form and time intervals prescribed in section 2 of the "Reclamation Safety and Health Standards."

d. The Contractor is responsible for being cognizant of and ensuring compliance with the requirements set forth in subparagraphs a. and b. above. Such responsibility shall apply to both the Contractor's operations and those of the Contractor's subcontractors. When violations of the safety and health requirements contained in these specifications or standards referenced in subparagraph a. are called to the Contractor's attention by the Contracting Officer or the Contracting Officer's authorized representatives, the Contractor shall immediately correct the condition to which attention has been directed. Such notice either oral or written, when served on the Contractor or the Contractor's representative(s), shall be deemed sufficient.

e. In the event the Contractor fails or refuses to promptly comply with the compliance directive issued under subparagraph d. above, the Contracting Officer or the Contracting Officer's authorized representative may issue an order to stop all or any part of the work. When satisfactory corrective action is taken, an order to resume work will be issued. The Contractor shall not be entitled to any extension of time, nor to any claim for damage or to additional compensation by reason of either the directive or the stop order. Failure of the Contracting Officer or the Contracting Officer's representative to order discontinuance of any or all of the Contractor's operations shall not relieve the Contractor of the Contractor's responsibility for the safety of personnel and property.

f. The Contractor shall maintain an accurate record of, and shall report to the Contracting Officer's authorized representative in the manner prescribed by the Contracting Officer, all cases of death, occupational diseases, or traumatic injury to employees or the public involved, and property damage in excess of $2,500 per incident to performance of work under this contract.

g. The rights and remedies of the Government provided in this paragraph are in addition to any other rights and remedies provided by law or under this contract.

h. In the event there is a conflict between the requirements contained in Reclamation's "Reclamation Safety and Health Standards," specifications paragraphs, Contractor's approved safety program, referenced safety and health codes and standards, or the U.S. Department of Labor Construction Safety and Health Standards, promulgated under section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 327 et seq.), as amended, the more stringent requirement will prevail.

i. The cost of complying with this paragraph shall be included in the prices bid in the schedule for other items of work.

1.4.3 SUBMISSION OF MATERIAL SAFETY DATA SHEETS FOR HAZARDOUS MATERIALS

Federal Standard No. 313, as amended, for the preparation and submission of material safety data sheets is hereby incorporated and made a part of these specifications.

In accordance with the clause entitled "Hazardous Material Identification and Material Safety Data," the Contractor shall submit a completed MSDS (Material Safety Data Sheet), Department of Labor Form OSHA-174, or GSA-approved Alternate Form A for each hazardous material as required by Federal Standard No. 313, as amended. The information in this MSDS shall be followed to assure safe use, handling, storage, and an environmentally acceptable disposal of the commodity used on the Government jobsite or by Government activities.

In lieu of the 5-day submittal requirement in the clause entitled "Hazardous Material Identification and Material Safety Data," the Contractor shall send, not less than 45 days prior to jobsite delivery of each hazardous material, completed MSDS and identification and certification for the material to the Bureau of Reclamation, Construction Engineer, PO Box 60400, Boulder City NV 89006-0400, with copies to the Bureau of Reclamation, Regional Safety Engineer, PO Box 61470, Boulder City NV 89006-1470, and to the Bureau of Reclamation, Attn D-7600, PO Box 25007, Denver CO 80225.

The cost of complying with this paragraph shall be included in the prices bid in the schedule for other items of work.

SECTION 1.5 - ENVIRONMENTAL QUALITY PROTECTION

1.5.1 LANDSCAPE PRESERVATION

a. General. - The Contractor shall exercise care to preserve the natural landscape and shall conduct construction operations so as to prevent any unnecessary destruction, scarring, or defacing of the natural surroundings in the vicinity of the work. Except where clearing is required for permanent works, approved construction roads, or excavation operations, natural surroundings shall be preserved and shall be protected from damage by the Contractor's construction operations and equipment. Movement of crews and equipment within the right-of-way and over routes provided for access to the work shall be performed in a manner to prevent damage. Discharge of any materials over canyon walls will be prohibited.

b. Costs. - The cost of all work required by this paragraph shall be included in the prices bid in the schedule for other items of work.

1.5.2 PREVENTION OF WATER POLLUTION

a. General. - The Contractor shall control pollutants by use of sediment and erosion controls, wastewater and stormwater management controls, construction site management practices, and other controls, including State and local control requirements.

(1) Construction site management. -

(a) Contractor construction operations. - The Contractor shall perform construction activities by methods that will prevent entrance, or accidental spillage, of solid matter, contaminants, debris, or other pollutants or wastes, into streams, flowing or dry watercourses, lakes, wetlands, reservoirs, or underground water sources. Such pollutants and wastes include, but are not restricted to: refuse, garbage, cement, sanitary waste, industrial waste, hazardous materials, radioactive substances, oil and other petroleum products, aggregate processing, tailings, mineral salts, and thermal pollution.

(b) Stockpiled or deposited materials. - The Contractor shall not stockpile or deposit excavated materials, or other construction materials, near or on stream banks, lake shorelines, or other watercourse perimeters where they can be washed away by high water or storm runoff, or can, in any way, encroach upon the watercourse.

(2) Construction safety standards. - The Contractor shall comply with the sanitation and potable water requirements of section 7 of Reclamation's publication "Reclamation Safety and Health Standards." Sanitation facilities will be made available to the contractor.

(3) Laws, regulations, and permits. - The Contractor shall perform construction operations in such a manner as to comply, and ensure all subcontractors to comply, with: (a) all applicable Federal, State, and local laws, orders, regulations, and Water Quality Standards concerning the control and abatement of water pollution; and (b) all terms and conditions of the applicable permits issued by the permit issuing authority. In the event there is a conflict between Federal, State, and local laws, regulations, and requirements, the most stringent shall apply.

(4) Contractor violations. - If noncompliance should occur, the Contractor shall report this to the Contracting Officer immediately (orally), with the specific information submitted in writing within 2 calendar days. Consistent violations of applicable Federal, State, or local laws, orders, regulations, or Water Quality Standards may result in the Contracting Officer stopping all site activity until compliance is ensured. The Contractor shall not be entitled to any extension of time, claim for damage, or additional compensation by reason of such a work stoppage. Corrective measures required to bring activities into compliance shall be at the Contractor's expense.

b. Cost. - Except as specified herein, the cost of complying with this paragraph shall be included in the prices bid in the schedule for items of work which necessitate the water pollution prevention measures required by this paragraph.

1.5.3 ABATEMENT OF AIR POLLUTION

The Contractor shall comply with applicable Federal, State, and local laws and regulations concerning the prevention and control of air pollution.

In conduct of construction activities and operation of equipment, the Contractor shall utilize such practicable methods and devices as are reasonably available to control, prevent, and otherwise minimize atmospheric emissions or discharges of air contaminants.

The emission of dust into the atmosphere will not be permitted during the manufacture, handling, and storage of concrete aggregate, and the Contractor shall use such methods and equipment as are necessary for the collection and disposal, or prevention, of dust during these operations. The Contractor's methods of storing and handling cement and pozzolans shall also include means of eliminating atmospheric discharges of dust.

Equipment and vehicles that show excessive emissions of exhaust gases due to poor engine adjustments, or other inefficient operating conditions, shall not be operated until corrective repairs or adjustments are made.

Storage and handling of flammable and combustible materials, provisions for fire prevention, and control of dust resulting from drilling operations shall be in accordance with the applicable provisions of the Bureau of Reclamation's publication "Reclamation Safety and Health Standards."

The cost of complying with this paragraph shall be included in the prices bid in the schedule for other items of work.

1.5.4 NOISE ABATEMENT

The Contractor shall comply with applicable Federal, State, and local laws, orders, and regulations concerning the prevention, control, and abatement of excessive noise.

The cost of complying with this paragraph shall be included in the prices bid in the schedule for other items of work.

1.5.5 CLEANUP AND DISPOSAL OF WASTE MATERIALS

a. General. - The Contractor shall be responsible for cleanup and for disposal of waste materials or rubbish. The disposal of waste materials and rubbish shall be in accordance with this paragraph and all applicable Federal, State, and local regulations, standards, codes, and laws. Also, the requirements contained in Reclamation's publication "Reclamation Safety and Health Standards," are applicable to cleanup and to disposal of waste materials and rubbish. In the event there is a conflict between the requirements contained in this paragraph, Reclamation's " Reclamation Safety and Health Standards," and other Federal, State, or local regulations, standards, codes, and laws, the more stringent requirement shall prevail.

In the event of the Contractor's failure to perform the work required by this paragraph, the work may be performed by the Government, at the expense of the Contractor, and the Contractor's surety or sureties shall be liable therefor.

b. Cleanup. - The Contractor shall at all times keep the construction area, including storage areas used by the Contractor, free from accumulations of waste materials or rubbish.

Prior to completion of the work, the Contractor shall remove from the vicinity of the work all plant facilities, buildings, rubbish, unused materials, concrete forms, and other like material, belonging to the Contractor or used under the Contractor's direction during construction. All work areas shall be graded and left in a neat manner conforming to the natural appearance of the landscape as provided in paragraph 1.5.1 (Landscape Preservation).

c. Disposal of hazardous materials. - Hazardous materials as defined by 40 CFR 261.3; Federal Standard No. 313, as amended; and/or other applicable Federal, State, and local regulations, standards, and codes used by the Contractor or discovered on the construction site shall be disposed of in accordance with these specifications and applicable Federal, State, and local regulations, standards, codes, and laws.

Contractor-generated waste materials that may be hazardous shall be tested, and the test results shall be submitted to the Contracting Officer for review. Contractor-generated

waste materials known or found to be, by testing, hazardous shall be disposed of in approved treatment or disposal facilities in accordance with Federal, State, and local regulations, standards, codes, and laws. A copy of the hazardous waste manifest shall be sent to the Contracting Officer.

Waste materials not generated by the Contractor and discovered at the site during construction activity shall immediately be reported to the Contracting Officer. If the waste is suspected to be hazardous, the Contractor onsite shall avoid the waste. The Contractor shall continue to avoid the waste area until the Government has properly and legally evaluated the hazard, determined it to be a Government responsibility, and either disposed of the waste or determined it to be nonhazardous. The Contracting Officer may order delays in the time of performance, or changes in the work or both, as a result of this potential hazardous waste discovery. If such delays, or changes in the work, or both, are ordered, an equitable adjustment will be made in accordance with the applicable clauses of this contract.

d. Disposal of other waste materials. -

(1) General. - Waste materials including, but not restricted to, refuse, garbage, sanitary wastes, industrial wastes, and oil and other petroleum products, shall be disposed of by the Contractor by removal from the construction area. Waste materials removed from the construction area shall be dumped at an approved dump.

(2) Disposal of material by removal. - Material to be disposed of by removal from the construction area shall be removed from the area prior to the completion of the work under these specifications. All materials removed shall become the property of the Contractor.

Materials to be disposed of by dumping shall be hauled to an approved dump. It shall be the responsibility of the Contractor to make any necessary arrangements with private parties and with county officials pertinent to locations and regulations of such dumping. Any fees or charges required to be paid for dumping of materials shall be paid by the Contractor.

e. Cost. - The cost of complying with this paragraph shall be included in the prices bid in the schedule for other items of work.

DIVISION 2 - SITEWORK

SECTION 2.1 - REMOVAL OF EXISTING MATERIALS

2.1.1 REMOVAL OF EXISTING CONCRETE AND STEEL MATERIALS

a. General.- The Contractor shall perform the following removal work:

(1) Core drilling of reinforced concrete for installation of the 24-inch diameter steel pipes in the Central Section Powerhouse where shown on drawing 11 (45-D-19408).

(2) Removal of existing structural steel items in the Central Section Powerhouse as shown on drawing 8 (45-D-14242).

(3) Removal of existing gratings and covers as required for mechanical piping installation modifications.

Removal of existing mechanical items is provided for in division 5.

b. Steel removal. - Steel items to be removed include the floor beams and all accessory materials including clip angles, base plates, shims, and expansion anchors beneath the concrete floor at elevation 616.0, and the grating, support beams and accessory materials for the pipe gallery lower operating platform.

The Contractor shall not remove the existing concrete floor at elevation 616.0. Temporary shoring of the existing concrete floor shall be in accordance with paragraph 4.1.1 (Structural Steel).

Existing anchor bolts shall be clipped flush with the concrete surface. Existing expansion anchors shall be removed. After removal of existing expansion anchors, the Contractor shall fill the holes with grout conforming to the requirements of paragraph 3.1.1 (Grouting Mortar for Equipment and Metalwork).

c. Disposal. - Removed materials shall be disposed of by removal from the worksite in accordance with paragraph 1.5.5 (Cleanup and Disposal of Waste Materials).

d. Payment. - Payment for removing and disposing of existing materials will be made at the lump-sum prices bid therefor in the schedule, which prices shall include the cost of removal and disposal of the existing materials.

SECTION 2.2 - UNWATERING

2.2.1 UNWATERING CENTRAL SECTION POWERHOUSE SUMP

a. General. - The Contractor shall perform all required unwatering of the sump located in the Central Section Powerhouse as is necessary for performance of the work under these specifications. Refer to drawing 3 (45-D-4601). The Central Section main sump has five interconnecting bays between building lines 6½ to 12½. The existing two 12-inch sump isolation valves are located at building lines 9 and 12. These valves make

it possible to separate the main sump into three sections; namely, the Nevada section (building lines 6½ to 9), the center section (building lines 9 to 10, and the Arizona section (10 to 12½).

The following items shall be considered for the outage:

(1) The powerhouse leakage comes in from the Arizona and Nevada powerhouses, collects over the sumps in a square concrete pipe, and the water is then released through the bottom of the square pipe by opening plug valves in the floor allowing the water to fall into the sumps.

(2) Additional water may come into the sumps from cooling water drains on the face of the upstream walls of the sumps up to 4 inches in size; cooling water drain lines in the downstream face of the sumps and on the downstream surface up to 8-inch diameter pipe, and some additional 1-inch to 2-inch diameter drains for rock seepage and joint leakage.

(3) New drain pipes are required from the plug valve to the sump which requires each sump to be drained so old piping can be removed and new piping installed.

(4) New eductors will require each of the end sumps, Arizona and Nevada, to be drained and the old eductors removed and new eductors installed.

(5) Plug valve repair in the concrete drain pipe may require diverting water around the work area.

(6) When using two sumps for unwatering, two electric pumps and one 24-inch eductor are the required minimum Government pumps.

(7) Installing new 24-inch valves to equalize water levels between sumps is best done after all overhead (drains) plug valves have been repaired, and all water diverted to the third sump, leaving two sumps dry to install new valves for equalization. When using a single sump to unwater, two Government pumps must be in operation as a minimum - one electric pump and one 24-inch eductor.

(8) Discharge valve repair. - Eductor discharge valves open directly into the river about 35 feet below the surface. Backflow from the river has to be shut off before removing the valves. The most obvious way to isolate the river from flowing into the powerhouse is using a diver to install a bulkhead from the river side. A minimum of two sumps for unwatering, two electric pumps and one 24-inch eductor shall be operational at all times for emergency use.

Removal of existing equipment will require isolating the work areas utilizing existing shutoff valves. Leakage past these shutoffs may occur. The Contractor shall control the leakage water as required to perform the work to the satisfaction of the Contracting Officer.

The Contractor shall at all times keep the water level in the sump located in the Central Section Powerhouse at a sufficiently low elevation to prevent flooding of the construction areas. The Contractor shall be responsible for any damage to the

structures, equipment, and materials due to its failure to keep the water at a sufficiently low elevation to prevent flooding. The repair of any damage to structures and repair and replacement of damaged equipment or materials, as determined by the Contracting Officer, due to the Contractor's failure to keep the water at a sufficiently low elevation to prevent flooding shall be made by and at the expense of the Contractor.

During unwatering operations, the Contractor must prevent oil-contaminated water from being discharged into the tailbay. Oil in the sump water is presently extracted by oil skimmers and absorbent socks. The Contractor's unwatering plan shall address means of preventing oil contaminated water from entering the tailbay.

Unwatering of the sump located in the Central Section Powerhouse shall be continued until all work has been successfully completed.

The existing sump pumps and piping may be used by the Contractor for performing its unwatering operations, with eductors being used only to overcome emergencies of less than two hours.

b. Submittals. - Submittals shall be in accordance with this paragraph and paragraph 1.1.3 (Submittal Requirements).

The Contractor shall submit, for approval, an unwatering plan showing the proposed method for unwatering the sump located in the Central Section Powerhouse during construction, as well as describing the measures to be taken to meet the Clean Water Act permit requirements and water quality standards required in paragraph 1.5.2 (Prevention of Water Pollution). The Government will require a 20 day period for review and approval of the unwatering plan. No unwatering work shall begin prior to approval of the unwatering plan.

The unwatering plan for the sump located in the Central Section Powerhouse shall contain not more than one major division of the work to be performed for unwatering during construction. This division shall be outlined and identified by title.

The unwatering plan may be placed in operation upon approval, but nothing in this paragraph shall relieve the Contractor from full responsibility for the adequacy of the unwatering works.

c. Payment. - Payment for unwatering the Central Section Powerhouse sump will be made at the lump-sum price bid therefor in the schedule for unwatering sump, which price shall include the cost of furnishing pumping units and other equipment and materials required for the unwatering work.

DIVISION 3 - GROUTING MORTAR

SECTION 3.1 - GROUTING MORTAR FOR EQUIPMENT AND METALWORK

3.1.1 GROUTING MORTAR FOR EQUIPMENT AND METALWORK

a. General. - Nonshrink grouting mortar and grouting mortar shall be furnished and placed as required and shall be in accordance with this paragraph. Except where nonshrink grouting mortar is shown on the drawings or specified in these specifications, the mortar for grouting shall be grouting mortar.

b. Nonshrink grouting mortar. - Nonshrink grouting mortar shall conform to the requirements of ASTM C 1107, grade A.

Nonshrink grouting mortar shall be composed of cement, water, sand, and aluminum powder. Cement shall be type I, II, or III portland cement in accordance with ASTM C 150, and shall meet the false-set limitation specified therein. Water and sand shall be in accordance with paragraph 3.1.3 (Materials), except that sand with 100 percent passing a No. 16 sieve shall be used when clearances are such that the specified grading for sand is not suitable. Aluminum powder, for use in the mortar shall be ground; shall contain no polishing agents, such as stearates, palmitates, and fatty acids; and shall effectively produce the desired expansion.

Mix proportions of jobsite-prepared nonshrink grouting mortar shall be 1 part cement to 1-1/2 parts sand, by weight, for a fluid mortar; and 1 part cement to 2 parts sand, by weight, for a plastic mortar; each containing a small amount of aluminum powder as specified below. The water-cement ratio of the mortar shall not exceed 0.50, by weight, and the slump of the mortar shall be the lowest practicable for the space to be filled. The exact mix proportions and water-cement ratio for the mortar will be determined by the Contracting Officer.

The quantity of aluminum powder to be used in jobsite-prepared nonshrink grouting mortar will be governed by the quantity and characteristics of the cement used, and will vary as the placing temperature varies, from about 2 grams of aluminum powder per bag of cement for 90°F placing temperature to about 5 grams at 40°F placing temperature. After weighing, the aluminum powder shall be thoroughly preblended with a small amount of portland cement before adding to the grouting mortar. This preblended material shall be a uniform blend of 1 part aluminum powder to 50 parts cement, by weight.

Unless inspection is waived in each specific case, the weighing and preblending of the aluminum powder and cement for the nonshrink grouting mortar and the mixing and placing of the nonshrink grouting mortar shall be performed only in the presence of the Government inspector.

c. Grouting mortar. - Grouting mortar shall be composed of cement, water, and sand. Cement shall be type I, II, or III portland cement in accordance with ASTM C 150, and shall meet the false-set limitation specified therein. Water and sand shall be in accordance with paragraph 3.1.3 (Materials), except that sand with 100 percent passing a No. 16 sieve shall be used when clearances are such that the specified

grading for sand is not suitable. Jobsite-prepared grouting mortar shall be mixed in the proportion of 1 part of portland cement to 2-1/2 parts of sand, by weight, and to the consistency prescribed by the Contracting Officer.

d. Preparation of surfaces and placing mortar. - Before placing mortar, the surfaces of base concrete to which the mortar will be bonded shall be roughened and shall be cleaned of all laitance, loose or defective concrete, curing compound and other coatings, and other foreign material by effective means, followed by thorough washing with water. If any delay occurs between the washing of the concrete and placing of the mortar, the surfaces of the concrete shall be lubricated by washing with water immediately before placing of the mortar. Forms shall be used, where required, to confine the nonshrink grouting mortar. The mortar shall be placed, completely filling spaces adjacent to equipment and metalwork as shown on the drawings.

e. Curing. - The exposed surfaces of mortar shall be cured for 72 hours by keeping them covered with moist burlap, damp sand, or by other effective means approved by the Contracting Officer.

Loads shall not be applied to the mortar sooner than 72 hours after placement and shall be applied only after the mortar has attained a compressive strength of at least 3,000 pounds per square inch. The time required for the mortars used to attain this strength will be determined by the Government. Care shall be taken when applying loads on the hardened mortar, and the Contractor shall be responsible for any damage thereto resulting from impact loads when positioning equipment or metalwork.

f. Cost. - The cost of all work in connection with placing mortar, and the cost of the cement, aluminum powder, water, and sand for mortar shall be included in the prices bid in the schedule for the items of work for which the mortar is required.

3.1.2 SUBMITTALS

Submittals shall be in accordance with this paragraph and paragraph 1.1.3 (Submittal Requirements).

a. Approval data. - Thirty days prior to placement of grouting mortar, the Contractor shall submit to the Government the name and manufacturer of each cementitious material. The Government reserves the right to require submission of manufacturer's test data and certification of compliance with specifications, and to require submission of samples of all concrete materials for testing prior to or during use in concrete.

b. Mix design. - The Contractor shall submit each grouting mortar mix design for approval prior to the use of the grouting mortar mix.

3.1.3 MATERIALS

a. Water. - Water shall conform to ASTM C 94, paragraph 4.1.3.1 (including table 1).

b. Sand - Sand shall consist of clean, hard, dense, durable, uncoated rock fragments that are free from injurious amounts of dirt, organic matter, and other deleterious substances. Sand shall meet all requirements of ASTM C 33.

DIVISION 4 - METALWORK

SECTION 4.1 - STRUCTURAL STEEL

4.1.1 STRUCTURAL STEEL

a. General. - The Contractor shall furnish and erect the following items of structural steel, including nonmetallic materials as specified:

(1) Support beams for locations C-2 and C-3 only in the Central Section Powerhouse as located and detailed on drawing 18 (45-D-19438). The structural steel shown on this drawing is to replace the structural steel shown on informational drawing 8 (45-D-14242). Removal and disposal of the existing steel shall be in accordance with paragraph 2.1.1 (Removal of Existing Concrete and Steel Materials).

(2) All plates, angles, bolts, nuts, washers, expansion anchors, wedge plates, and other accessory material required for the complete erection of the support beams.

(3) Grouting mortar.

The Contractor shall provide temporary shoring and bracing for the existing concrete floor slab during removal of the existing steel beams and during installation of the new steel beams. The Contractor shall provide a positive means to ensure that floor loads are transferred to the new steel support beams.

Existing anchors and anchor holes shall not be used for installing the new support beams. Existing anchors shall be clipped flush with the concrete surface.

b. Design. - The Contractor shall design temporary shoring and bracing members to support the concrete floor at elevation 616.00. The shoring and bracing shall be designed to support the dead load of the floor plus a superimposed live load of 100 pounds/square foot during construction.

c. Submittals. - Submittals for structural steel shall be in accordance with the following requirements and the requirements of paragraph 1.1.3 (Submittal Requirements).

The Contractor shall verify all field conditions before preparing the installation plan and the shop and erection drawings, and before fabrication and installation of the new support beams.

The Contractor shall verify existing field conditions and diameters and locations of expansion anchors before submitting shop drawings. The Contractor shall submit to the Contracting Officer, for approval, any modifications to connection details shown on the drawings.

(1) Approval drawings. - The Contractor shall prepare all necessary shop and erection drawings of the structural steel items specified in subparagraph a.(1) above. The erection drawings shall show all field bolting. Shop drawings shall include a reference sheet showing the mark designation of members and the drawings upon which the members are shown.

(2) Installation plan. - The installation plan shall be prepared by a registered professional engineer and shall show the following:

(a) Method of temporary shoring and bracing to be used for support of the concrete floor during removal and replacement of the support beams.

(b) Method of ensuring that the floor load is transferred to the new support beams.

(c) Type and location of expansion anchors.

(3) Final drawings. - Within 40 days before shipment of materials to the site, the Contractor shall submit all final shop and erection drawings for the structural steel. The drawings shall show all changes and revisions, with revision dates, made up to the time the fabrication is complete and the materials are ready for shipment.

d. Materials. -

(1) Structural steel. - ASTM A 36.

(2) Bolts. - All bolts shall be heavy hexagon structural bolts in accordance with ASTM A 325.

(3) Nuts. - ASTM A 563.

(4) Washers. - ASTM F 436.

(5) Stainless steel expansion anchors. - Commercial Item Description A-A-1923A, type 4. Expansion anchors shall be stainless steel type 304 and shall be of a minimum size shown on the drawings. Where the length of bolt or minimum embedment is not indicated, the bolt length shall provide a 3 ½-inch minimum embedment.

(6) Arc-welding electrodes. - All filler metal and required shielding gases or fluxes shall be in accordance with the requirements of the AWS D1.1 "Structural Welding Code - Steel". Filler metal for steel shall have a minimum tensile strength of 70,000 psi.

(7) Grouting mortar. - Grouting mortar shall be in accordance with the requirements of paragraph 3.1.1 (Grouting Mortar For Equipment and Metalwork).

e. Fabrication. -

(1) General. - All work shall be equal to the best modern practice in the manufacture and fabrication of materials of the types covered by these specifications or drawings. Details of design or fabrication not covered by the drawings or by these specifications shall conform to the applicable provisions of the "Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings" including all supplementary provisions of AISC.

(2) Straightening material. - Before being laid out or worked in any way, structural material shall be straight and free from sharp kinks and bends. If straightening is necessary, it shall be done by methods that will not injure the metal.

(3) Shearing and cutting. - Shearing and cutting by torch or electric arc shall be performed carefully, and all portions of the work which will be exposed to view after completion shall be finished neatly. Reentrant cuts and copes shall be shaped notch free to a radius of at least one-half inch.

(4) Holes. -

(a) General. - All holes shall be cylindrical, unless otherwise shown on the drawings, perpendicular to the member, and clean cut and without burred or ragged edges. Holes in material more than 1 inch thick shall be drilled. All other holes may be punched or drilled to full size.

(b) Drilled holes. - Unless otherwise shown on the drawings, drilled holes shall be 1/16 of an inch larger than the nominal diameter of the bolt. Remove all burrs outside or inside hole resulting from drilling.

(c) Punched holes. - Unless otherwise shown on the drawings, the diameter of the punch for punching to full size shall be 1/16 of an inch larger than the nominal diameter of the bolt. The diameter of the die shall be not more than 3/32 of an inch larger than the diameter of the punch.

(5) Edge distances and bolt spacing. - Unless otherwise shown on the drawings or noted in the specifications, edge distances and bolt spacing shall conform to the requirements of the "Specifications for Design, Fabrication, and Erection of Structural Steel of Buildings" of AISC.

(6) Bolts, washers, and nuts. - The length of connection bolts shall be in 1/4-inch variations, and when in the structure, the bolts shall extend at least 1/4 of an inch beyond the nuts. Washers shall be used under heads of all connection bolts where shown or called for on the drawings.

(7) Welding. - All welding and work related thereto, including any stress-relieving treatment, shall comply with the AWS Structure Welding Code (AWS D1.1) and AISC specifications. All welding terms shall be interpreted in accordance with AWS definitions of welding terms (AWS A3.0). Welding symbols shown on the fabricator's shop drawings shall comply with AWS symbols (AWS A2.0), unless otherwise noted.

All welds shall be of the types specified on the drawings. However, the Contractor may use submerged arc welding where manual welding is shown. All welds shall be continuous unless otherwise noted and shall be made in such a manner that residual shrinkage stresses will be reduced to a minimum. Where feasible, all welding shall be submerged arc to minimize welding distortion and residual shrinkage stresses. Insofar as practicable, all welds shall be deposited in a sequence that will balance the applied heat of welding while the welding progresses.

(8) Temperature correction. - The overall length of any member or assembly of members shall be as shown on the shop drawings, within tolerances permitted in standard shop practice, with the temperature of the ambient air at 68°F. If there is any considerable variation from this temperature when measurements are made, the measured dimensions shall be corrected, based on the coefficient of linear expansion of 0.00000636 per unit length per degree Fahrenheit.

All structural steel shall be painted after fabrication unless otherwise noted on the drawings.

f. Erection. - All structural steel shall be accurately assembled and erected in accordance with the approved drawings and the applicable provisions of the "Specifications for Design, Fabrication, and Erection of Structural Steel for Buildings" of AISC. All matchmarks of the fabricator shall be carefully followed. Members shall not be overstressed during the process of erection, and hammering that will injure or distort the members will not be permitted. Corrections of minor misfits and a reasonable amount of reaming shall be considered a legitimate part of erection. Bearing surfaces and surfaces to be in permanent contact shall be cleaned before the members are assembled or erected. Bolted connections shall be made with high-strength bolts as shown on the approved erection drawings. The bolts shall be drawn tight; and where directed by the Contracting Officer, the threads shall be burred so that the nuts cannot become loosened.

The Contractor shall erect temporary shoring and bracing members to support the concrete floor at elevation 616.00. All shoring and bracing shall be in place before beginning removal of existing structural steel as specified in paragraph 2.1.1 (Removal of Existing Concrete and Steel Materials) and shall not be removed until the new support beams are installed and the grouting mortar has cured. The shoring and bracing material shall remain the property of the Contractor and shall be removed from the site of the work when no longer needed.

Erection of structural steel shall be by bolting or arc welding, or by a combination of these, as shown on the drawings or described in these specifications; and the Contractor shall be prepared to perform both classes of work. Only qualified welding operators shall be employed to perform the welding; and if required by the Contracting Officer, each such welding operator shall submit satisfactory evidence of ability before being allowed to perform the work.

The Contractor shall use diamond bits to drill all holes in concrete required for the installation of expansion anchors, in order to achieve straight and true holes. Holes shall be roughened in accordance with manufacturer's requirements before installation of the anchors. If drilling water is used, surfaces of concrete to remain exposed shall be cleaned immediately to prevent discoloration.

Grouting mortar shall be furnished and placed where shown on the drawings in accordance with the requirements of paragraph 3.1.1 (Grouting Mortar For Equipment and Metalwork).

g. Painting. - Structural steel surfaces exposed after installation and damaged areas of painted surfaces after installation, shall be painted in accordance with paragraph 6.1.1 (Painting and Coating, General).

h. Payment. - Payment for furnishing and erecting structural steel will be made at the lump-sum price bid therefor in the schedule, which price shall include the cost of verifying existing field conditions and the designing, furnishing, installing and removing of the temporary shoring.

The cost of removing the existing structural steel is provided for in paragraph 2.1.1 (Removal of Existing Concrete and Steel Materials).

DIVISION 5 - MECHANICAL

SECTION 5.1 - MECHANICAL, GENERAL

5.1.1 DRAWINGS AND DATA TO BE FURNISHED BY THE CONTRACTOR

a. General. - In accordance with this paragraph and paragraph 1.1.3 (Submittal Requirements), each drawing submitted by the Contractor shall reference the Contractor's or supplier's title and drawing number. Drawings and data shall show the Bureau of Reclamation contract number and the schedule item number. All dimensions on the drawings shall be in feet and inches and all wording, signs, and symbols shall be in English. Drawings shall be prepared using manual or computer drafting equipment and shall have neat lettering. Freehand sketches will not be acceptable.

b. Approval drawings and data. - As soon as practicable after date of receipt of notice to proceed and before proceeding with fabrication or procurement of material, the Contractor shall submit, to the Government for approval, the number of copies of checked drawings and data listed in paragraph 1.1.3 (Submittal Requirements). When revised drawings and data are resubmitted, the changes from previous submittals shall be clearly identified. Any fabrication or procurement performed, or shipment made, before approval of the drawings and data, shall be at the Contractor's risk. Where the Contractor is required to design equipment, the Government will have the right to require the Contractor to make any changes in the equipment design which the Government determines necessary to make the equipment conform to the requirements of these specifications without additional cost to the Government. Approval by the Government of the Contractor's drawings or data shall not be held to relieve the Contractor of any part of the Contractor's responsibility to meet all of the requirements of these specifications or of the responsibility for the correctness of the Contractor's drawings.

Where approval data are required for commercial products or equipment, the Contractor shall submit complete identifying data giving the manufacturer's name, type, model, size, materials, and construction and performance characteristics of the equipment. Performance data shall include any applicable correction factors which shall be applied in sizing the equipment to meet the requirements of these specifications. When a catalog sheet is submitted, the particular item proposed shall be underlined or marked so that the data can be legibly reproduced. The data shall be comprehensive and shall fully demonstrate that all equipment provided shall meet the requirements of these specifications. One copy of the approved data will be returned to the Contractor.

c. Final material. - As soon as practicable, but no later than the date the equipment is ready for shipment, the Contractor shall submit to the Government the number of copies of final material listed in paragraph 1.1.3 (Submittal Requirements).

When drawings are a part of final material requirements, they shall show all changes and revisions, with revision dates, made up to the time the equipment is completed and ready for shipment.

When service manuals are required, bound original manufacturer's brochures shall be furnished, and each shall contain an index; complete parts identification lists; lists of

special tools, and detailed instructions for the installation, operation, lubrication, and maintenance of the equipment.

5.1.2 MANUFACTURER'S NAMEPLATE

Cast, embossed, or stamped lettering will not be permitted on any of the Government-designed equipment detailed on the drawings. However, small brass nameplates giving manufacturer's name, address, date, and other pertinent data may be provided for various major components of fabricated equipment.

Nameplates for commercial products shall be the manufacturer's standard nameplate.

SECTION 5.2 - REMOVAL AND DEMOLITION

5.2.1 REMOVAL OF EDUCTORS AND ASSOCIATED EQUIPMENT IN CENTRAL SECTION POWERHOUSE SUMP

a. General. - The Contractor shall remove and dispose of equipment in the Central Section Powerhouse including the following:

(1) The two existing 12-inch jet pumps and the two existing 24-inch eductors, including associated equipment;

(2) Equipment at the control stations;

(3) The existing 3-inch eductor including associated equipment;

(4) 12-inch sump gate valves; and

(5) Tail pipes and float chambers.

b. Submittal. - The Contractor shall provide details of the bulkhead in accordance with paragraph 1.1.3 (Submittal Requirements), and paragraph 2.2.1.a.8.

c. 12-inch jet pumps and 24-inch eductors. Refer to drawings 9 (45-D-19406), 10 (45-D-19407), and 12 (45-D-19409), and informational drawings 4 (45-D-14290) and 5 (45-D-14228).

The Contractor shall remove the two existing 14-inch diameter check valves designated as "V1" shown on informational drawing 4(45-D-14290) and all piping connected between these check valves, including the jet pumps, eductors and associated supply piping, intake piping, discharge piping, valves, metal supports, and hangers; and dispose of all the above equipment except for the following:

(1) The pipe supports designated as H4, H5, H6, H7, H8, H10, H17, and H18 on informational drawing 4 (45-D-14290) for the existing eductor and jet pump high pressure supply piping located at elevation 636.83 are to be reused and modified as needed to adequately support the new 12-inch-diameter high-pressure supply piping as shown on drawing 9 (45-D-19406).

(2) Two of the 24-inch-diameter check valves, the two 14-inch-diameter check valves, and the two 24-inch "Chapman" gate valves located on the discharge piping of the existing jet pumps and eductors are to be repaired and reused for the new eductors as shown on drawing 9 (45-D-19406). The remaining two 24-inch-diameter check valves are to remain the property of the Government and are to be stored as directed by the Contracting Officer. See paragraph 5.3.2 (Repair of Valves).

(3) The piping downstream of the 24-inch "Chapman" gate valves is submerged below the surface of the river. The Contractor shall provide and place a bulkhead before the valves can be removed. Details of the bulkhead shall be provided to the Contracting Officer before installation.

(4) The 12-inch gate valve used for isolation between Arizona and Nevada located at elevation 636.83 is to remain and be installed with the new 12-inch high pressure supply piping as shown on drawing 9 (45-D-19406).

d. Control stations and associated control piping and valves, and vent piping and valves. - Refer to informational drawing 4 (45-D-14290).

The Contractor shall remove all equipment, brackets and supports at the control stations located at floor elevation 643.00 and elevation 673.0. Remove the control piping and valves (various sizes including 1/2-inch, and 3/4-inch diameter), 1/4-inch vent piping and valves, and equipment associated with the eductor controls and the 12-inch roto-valves.

e. 3-inch eductor. - Refer to drawing 11 (45-D-19408) and informational drawing 6 (45-D-8463).

The Contractor shall remove all piping, valves (including operators), eductor, concrete support pedestals, and metal supports and hangers located downstream of the 3-inch diameter gate valve designated as "V2" shown on informational drawing 6 (45-D-8463); and provide an ANSI Class 300 blind flange, bolts, and gasket to connect to the downstream side of the 3-inch diameter gate valve. Any openings in the sump walls or the sump drain galley walls shall be grouted closed whether or not associated embedded piping can be removed.

f. 12-inch diameter sump gate valves. - Refer to drawing 11 (45-D-19408).

The Contractor shall remove the two 12-inch-diameter gate valves and associated floor stand, stem guides, and valve stem located in the sump located on the centerline of the power plant between wall "C" and wall "D".

g. Tail pipes and float chambers. - Refer to informational drawing 7 (45-D-8462).

The Contractor shall remove the tail pipes for the 24-inch plug valves and the float chambers located in the sump galley below elevation 616.00. The tailpipes shall be replaced with new piping as provided for in paragraph 5.3.1 (Piping, Valves, and Eductors) and as shown on the drawing 17 (45-D-19414).

h. Disposal. - All material specified herein, except as indicated, will become the property of the Contractor and shall be removed from the worksite and disposed of in accordance with paragraph 1.5.5 (Cleanup And Disposal Of Waste Materials).

i. Payment. - Payment for removing and disposing of the existing jet pumps and eductors and associated equipment will be made at the lump-sum price bid therefor in the schedule.

SECTION 5.3 - STEEL PIPING

5.3.1 PIPING, VALVES, AND EDUCTORS

a. General. - The Contractor shall furnish and install the piping, valves and eductors in the Central Section Powerhouse sump complete in accordance with the requirements of these specifications and as shown on drawings 9 (45-D-19406) through 17 (45-D-19414), and drawing 22 (40-D-6248).

Painting, lining, and coating shall conform to division 6 (Painting).

b. Submittals. - Drawings and data furnished by the Contractor shall be in accordance with paragraph 1.1.3 (Submittal Requirements), paragraph 5.1.1 (Drawings And Data To Be Furnished By The Contractor), and this paragraph.

(1) Approval drawings and data. -

(a) Commercial products data for the equipment specified in subparagraph c.

(b) Shop drawings. - Shop drawings of the eductors and piping shall be detail shop drawings which include all dimensions and tolerances, all material data, all joint details, all painting, lining, and coating, and all welding.

(2) Final data. -

(a) Service manuals. - Equipment specified in subparagraph c.

(b) Final drawings. - Eductors and piping. The final drawings shall show the modifications of the existing pipes.

(c) Test procedures for eductor testing specified in subparagraph c.

c. Materials. -

(1) Structural steel. - ASTM A 36.

(2) Steel plate. - ASTM A 283, grade C or D, or ASTM A 36.

(3) Stainless steel plate. - ASTM A 167, type 304L.

(4) Bronze plate. - Aluminum bronze, ASTM B 148 alloy 952.

(5) Standard or schedule steel pipe. - ASTM A 53, Type E or S, grade A or B, and black.

(6) Stainless steel pipe. - ASTM A 312, type TP304L or TP316L.

(7) Fiberglass reinforced plastic (FRP) pipe. - ASTM D 2310, type I or II, grade 1, class A, minimum pressure category D, bell and spigot connections, with a minimum internal pressure rating of 200 pounds per square inch service.

(8) Fiberglass reinforced plastic (FRP) flanges. - ASTM D 4024, grade 1, class 2, minimum pressure category D, drilled to ANSI B16.5 for 200 pounds per square inch service.

(9) Solvent cement for FRP. - Suitable for submerged service, as recommended by the FRP supplier.

(10) Welding fittings. - Fittings shall be steel or stainless steel as shown on the drawings. The tees shall have no welds in the throat area and the crotch shall be reinforced with long radius design to eliminate sharp corners.

(a) Steel fittings shall conform to ANSI B16.9.

(b) Stainless steel fitting shall conform to ASTM A 403. Material shall match that used for the stainless steel piping.

(11) Screwed fittings. - Federal Specification WW-P-521, type 2.

(12) Flanges. - Flanges shall be lap joint or slip-on welding flanges as shown on the drawings and shall be in accordance with ANSI B16.5, with ring joint face, carbon steel, material group 1.1, class 150 or 300 as shown on the drawings.

Stainless steel flanges shall conform to ANSI B16.5 with ring joint face. The material used shall match that of the stainless steel piping used.

(13) Anchor bolts. - Anchor bolts shall be stainless steel expansion anchors or stainless steel bolts with epoxy-resin bonding system.

(a) Expansion anchors. - Expansion anchors shall be stainless steel and shall be of a minimum size shown on the drawings. Expansion anchors may be drop-in anchors, or other type of expansion anchor as required, and shall be suitable for use in new concrete holes.

(b) Bolts with epoxy-resin-bonding system. - Each bolt with epoxy-resin-bonding system shall consist of a bolt, nut, washer, and an epoxy-resin-bonding glue. The epoxy-resin-bonding system shall conform to ASTM C 881, type 1. The bolts, nuts, and washers shall be stainless steel.

After drilling, the concrete holes shall be blown clean with an airstream and plugged with a neoprene stopper or other suitable plug to prevent access of

water so as to keep the holes as dry and clean as is practical prior to installing the bolts in the holes.

The hole and surrounding concrete shall be dry before installing the bolt. The epoxy-resin shall be placed in accordance with the manufacturer's instructions, and the bolt inserted in place within the time recommended by the manufacturer. The hole shall be completely filled with epoxy after installation. After installation of the bolts, care shall be taken not to disturb them before the initial set of the bonding system has occurred.

(14) Flange gaskets. - ANSI B16.20, ring joint for ANSI Class 150 and Class 300 flanged joints.

(15) Flange insulation. - Provide sealing gasket kits with the following salient characteristics:

(a) Full faced gaskets, bolt sleeves, and washer sets.

(b) The outside diameter of the gasket shall be the same as the outside diameter of the flange. The material shall be high energy, o-ring elastomer which maintains constant sealing force. Asbestos materials are not acceptable.

(c) The gasket thickness shall be 1/8-inch. One sleeve and two insulating washers shall be provided for each bolt.

(16) Butterfly valves. - The butterfly valves shall conform to AWWA standard C504, class 150B. The butterfly valves shall be flanged and manually operated as shown on the drawings. The axis of the valve leaf shall be horizontal when the valve is in the installed position as shown on the drawings.

The 24-inch-diameter butterfly valves shall be provided with a gear box mounted on the valve and shall be suitable for submerged service under 27 feet of water or less as shown on the drawings. Each valve shall be provided with a floor stand complete with operator and position indicator. Extension stems, wall mounted stem guides, and universal joints shall be provided where required.

The 6-inch diameter butterfly valve shall be provided with a lever type operator.

(17) Gate valves. - The 20-inch-diameter gate valve shall conform to AWWA C500 with flanged ends, solid wedge disk, fully ported, manually operated. It shall be supplied with a bevel geared operator.

(18) Ball valves. - Provide ball valves for the Central Section Powerhouse sump eductor supply piping and for the air valve assemblies.

(a) Ball valves for eductor supply piping. - The 8-inch- and 10-inch-diameter ball valves shall have full 100 percent circular port openings with manufacturing and testing conforming to AWWA C507. The valves shall be suitable for throttling with a cold-water working pressure of 300 pounds per square inch gauge. The maximum flow through the 10-inch-diameter ball valve will be

approximately 4000 gallons per minute. The maximum flow through the 8-inch-diameter ball valve will be approximately 2500 gallons per minute.

The valves shall be flanged, metal to metal seated, single seated, tight closing, trunnion mounted complete with a tandem pneumatic/oil cylinder operated actuator. The allowable stresses shall not exceed one-third of the yield strength or one-fifth of the tensile strength of the materials used. As much as feasible, each ball valve shall be furnished as a fully integrated and assembled unit consisting of the ball valve, valve operating mechanism, valve actuator and valve controls, all integrally mounted as a complete unit.

The manufacturer of the ball valves shall retain singular unit responsibility for furnishing the ball valves, valve operating mechanisms, actuators, control package, and shall assume complete responsibility for the proper operation of the entire system regardless of the original manufacturer of the equipment being furnished. The valves shall have the following salient characteristics:

(aa) Body. - The body shall be ductile iron or cast steel.

(bb) Ball. - Valve ball shall be ductile iron or cast steel. The ball shall have two integrally cast bronze or stainless steel bushed trunnions included on the axis of rotation.

(cc) Valve seats. - The ball and body seats shall be bronze, stainless steel, or Monel (alloy 400). The valve seats shall be fully field adjustable and replaceable without dismantling the operator, ball, or shaft.

(dd) Bearings. - Bearings shall be sleeve type and provided on both the body and ball trunnions. Bearings of non-metallic surfaces, compounds, and materials will not be accepted.

(ee) Body flanges. - Flanges shall be faced and drilled in accordance with ANSI B16.5, Class 300 for steel flanges and ANSI B16.1, Class 250 for ductile iron flanges. They shall be faced suitable for connection with the mating ring joint steel pipe flanges described elsewhere in these specifications. The Contractor shall coordinate with the valve manufacturer in the selection of the proper finish for the valve flange surface.

(ff) Shafts. - Shafts shall be stainless steel. Plated steel shafts are not acceptable.

(gg) Valve operating mechanism. - The valve operating mechanism shall be an integrally mounted traveling-nut, compound link/lever type employing a traveling nut attached to and powered by the valve actuator to impart purely linear motion of the traveling nut to positive rotary motion to the ball through the compound link/lever. It shall be provided with a suitable mechanical valve position indicator mounted directly to the end of the

operating shaft and shall indicate angle of ball rotation between 0 and 90 degrees.

(hh) Actuator. - The ball valves shall be provided with tandem pneumatic/oil hydraulic valve actuators. The actuators shall conform to AWWA C540. The pneumatic operator shall have 1/4-inch pressure/drain ports. The operator shall operate the valve under full water pressure to either the fully open or close position or an intermediate throttling position with a minimum operating air pressure of 80 pounds per square inch and shall be able to withstand operating air pressure of 150 pounds per square inch. The actuators shall be directly and rigidly mounted on the valve operating mechanism and shall not pivot, swivel, swing, rotate, or otherwise be moveable. Each actuator shall be sized to operate the ball valves at the design pressure class and a maximum full open port velocity of 35 feet per second with a minimum of 80 pounds per square inch gauge air pressure.

The actuator shall be direct, double acting and non-cushioned. It shall be fully assembled and close coupled to the valve operating mechanism with the piston rod totally enclosed in the valve operating mechanism housing.

Each actuator shall be constructed of heavy wall, seamless, steel tubing, fitted to the cylinder heads and shall be suitable for direct flange type mounting at the rod end. The upper pneumatic cylinder shall be directly "piggyback" attached to the lower oil hydraulic cylinder and the pneumatic cylinder rod shall extend into the oil hydraulic cylinder and directly connect to the oil hydraulic cylinder piston so they act uniformly in tandem.

1. Air/oil cylinders. - Pneumatic cylinder tubes shall be constructed of chrome plated steel, brass, or bronze with an inside surface finish of at least 16 micro-inch. Cylinder heads and caps shall be constructed of corrosion protected steel or cast iron. Cylinder pistons shall be constructed of plated cast iron or ductile iron. Piston rods shall be constructed of chrome plated steel or stainless steel. Cylinders shall be equipped with a wiper ring to clean the piston rod before entering the cylinder. Piston seals shall be of Buna-N rubber. Cylinder design shall have a safety factor of at least five based on the operating conditions. A separate oil hydraulic cylinder shall be provided and shall be used to control opening and closing speeds. Construction of the oil cylinder shall be as noted in 2. below.

2. Oil hydraulic cylinders. - Cylinder tubes shall be constructed of steel with an inside surface finish of at least 16 micro-inch. Cylinder heads and caps shall be constructed of corrosion protected steel or cast iron. Cylinder pistons shall be constructed of cast iron or ductile iron. Piston rods shall be constructed of chrome plated steel or stainless steel. Cylinders shall be equipped with a wiper ring to clean the piston rod before entering the cylinder.

Piston seals shall be of Buna-N rubber. Cylinder design shall have a safety factor of at least five based on the operating conditions.

(ii) The ball valves shall be provided with a hand held actuator which will permit emergency manual operation of the valves upon loss of air pressure.

(b) Ball valves for air valve assemblies. - Ball valves shall be in accordance with MSS SP-110 and constructed of carbon steel, full-ported, female screwed ends, with cold water pressure rating of not less than 300 pounds per square inch. Valves shall be bubble tight at the rated pressure in either direction and suitable for operation after long periods of inactivity.

(19) Check valve. - The check valve to be installed downstream of the new 16-inch-diameter eductor shall have the following salient characteristics:

(a) Wafer style,

(b) Tilting disk,

(c) Minimum pressure rating of ANSI class 125,

(d) Iron body,

(e) O-ring seal mounted on the disk or the body, and

(f) Stainless steel spring assisted closure.

(20) Air valves. - Furnish one combination air and vacuum/air release valve and two pressure air release valves as shown on the drawing 9 (45-D-19406). The air valves shall have the following salient characteristics:

(a) The combination air and vacuum/air release type and the pressure air release valve are actuated by a float. The combination air and vacuum/air release type remains open for filling the line until the water has displaced all air at the point of attachment of the valve assembly after which it closes, and opens whenever the pressure in the pipeline drops sufficiently to create a vacuum. It also continuously releases trapped air when the pipeline is under pressure. The pressure air release valve continuously releases air when the pipeline is under pressure.

(b) Each valve shall have two petcocks, one at the top to permit checking the effectiveness of the air valve and one at bottom to allow the valve to be drained.

(c) Stainless steel internal parts, such as guides, bushings, and screws.

(d) Stainless steel floats.

(e) Float-pivot supports are brass, bronze, stainless steel, or cast iron.

(f) Cold-water pressure rating for the body of the valve is at least 300 pounds per square inch.

(g) Internally threaded National Pipe Thread (NPT) inlets and outlets.

(21) Eductors. -

(a) General. - Two 24-inch-diameter (6000-gallon-per-minute suction capacity) and one 16-inch-diameter (3000-gallon-per-minute suction capacity) water jet eductors and construction shall be furnished as replacements for the existing eductors. The eductors are used primarily to remove water from the powerhouse sump as emergency back up to the existing electric pumps. They shall be subject to variations in motive and suction water pressure as shown in Table 5A below. They shall be required to provide the specified discharge under all conditions as shown in Table 5B below. Regulation of the actuating pressure shall be accomplished by opening or closing the pneumatic operated ball valves located upstream of each eductor. These valves are either operated manually or automatically, locally or remotely. Eductors in all cases shall perform satisfactorily under all conditions as required, and indicated, in Table 5A and shall give the best efficiency when operating under a rising suction pressure. Specified discharge pressure and volume shall be at the terminus of the Contractor supplied equipment, with all friction losses due to piping and valves taken into account.

Eductors as manufactured by Ketema Corporation, Schutte & Koerting Division, 2233 State Road, Bensalem PA 19020; or equal having the following salient characteristics:

(aa) The eductor shall be of a vertical orientation as shown on the drawings. Eductor body shall be either cast or fabricated construction. Eductor body shall be heat treated as necessary to prevent sensitization and maximize corrosion resistance. The eductor body shall be stainless steel, type 304L or ASTM A 743 and A 744, CF-8. All parts subject to erosion and/or cavitation (e.g. nozzle and mixing tube) shall be field replaceable and constructed of stainless steel or aluminum bronze. All materials are subject to approval by the Contracting Officer.

(bb) To allow ease in installation of the eductors, each eductor shall be constructed in sections. The maximum length of a section of an eductor shall not be greater than 72 inches. Each joint of the sections shall be flanged. Flange ratings and types shall be as shown on the drawings. All joints between standard steel pipe and stainless steel pipe shall have insulated joints. Eductor body shall be designed to withstand a working pressure of 300 pounds per square inch gauge. The diffuser cone or tail piece shall have a minimum wall thickness of 1/2-inch. Suitable baseplates similar to those shown on the drawings or of an equal design shall be provided integrally with the body of the eductor for anchoring it securely to the floor. The base plates and number and type of anchor bolts shall be designed for any vibrational, thrust, or shear forces which may be generated during operation of the eductors.

(cc) The eductor tail pieces shall be designed to safely withstand the maximum back-pressures that the eductors may build up, with discharge completely shut off and maximum head on the actuating water. The internal surface finish shall be 125 microns, root mean square (RMS).

(b) Testing. -

(aa) Factory testing. - The Contractor shall perform tests at the factory on a scale model to verify all performance parameters. Test procedures shall be approved by the Contracting Officer's representative. Test procedures shall be submitted prior to testing of any eductor scale model. The procedure submitted shall reference all applicable standards mentioned herein including those of ASME and ANSI. A written 7-day notice shall be given to the Contracting Officer's representative so that a Government representative may be present to witness the testing. The cost of this testing shall be incorporated in the lump-sum price bid in the schedule for furnishing and installing piping, valves, and eductors in the Central Section Powerhouse.

The eductors shall be designed for a cold water working pressure of 300 pounds per square inch and tested at the factory to a hydrostatic test pressure of 450 pounds per square inch.

Performance tests shall show that the eductors meet the NORMAL operating criterion of actuating and discharge pressure, and actuating and discharge flow, through the operating conditions shown in Table 5A (Eductor operating conditions) below. The performance test shall determine the performance of the eductors subject to suction water elevations from elevation 605 feet through elevation 618 feet. If the Contracting Officer determines that the specifications have not been met and the anticipated performance of the eductors cannot meet the quantities shown in Table 5B (Eductor anticipated performance) below, then the Contractor shall correct the cause or replace.

In addition to the suction water elevations shown in Table 5A (Eductor operating conditions) below, the best performance of the eductors shall be determined for suction water elevations from 618 feet through elevation 635 feet.

(bb) Field testing. - Field testing of the eductors shall be performed in conjunction with the testing of the pneumatic control system referred to in item (22) "Pneumatic control system" below. Both shall be done in the presence of the Contracting Officer's representative.

After the eductors have been completely installed, they shall be test-operated to demonstrate that the equipment has been installed as required by the specifications. The eductor control valves shall be operated from the fully open to the fully closed position three times. The eductors shall operate smoothly without observable vibration.

During the operational tests, the flow control shall be adjusted to vary the discharge of the eductors. Portable flowmeters shall be provided by the Contractor to measure flow into the eductors and exiting out of the eductors.

All required changes, adjustments, or correction of defects shall be performed by the Contractor and re-tested by the Government until operation of the eductors is satisfactory to the Contracting Officer. Following any required corrections or adjustments, the eductors shall be re-tested at the option of the Contracting Officer until operation of the eductors, and all appurtenant equipment is satisfactory to the Contracting Officer.

(c) Operating conditions. - The eductors shall be designed for the following operating conditions:

Table 5A.- Eductor operating conditions

Conditions	Pressure head actuating water (feet)	Elevation of discharge water (feet)	Elevation of suction water (feet)
Minimum	463	625	605
Normal	531	647	615
Maximum	634	666	645

Table 5B.- Eductor anticipated performance

Operating conditions	Total discharge (gpm)	
	16"	24"
Worst	≥4000	≥6000
Normal	≥5000	≥10000
Best	≥8000	≥15000

(22) Pneumatic control system. -

(a) General. - One complete pneumatic control system is required for each of the three eductors as shown on the drawings and shall include all air lines, supports, ball valves with pneumatic-operators, tanks, pneumatic control valves, and other external equipment required to complete the control system.

Air lines connecting components shall be 3/4-inch welded or seamless stainless schedule 40 pipe cut to length and welded. Pipe fittings shall be socket weld-type with adapter ends as required for connection to commercial components.

The pneumatic control system shall be arranged and built generally as shown on the drawings. The actual location of the air tanks and controls will be determined by the Contracting Officer's representative. The line diagram shown on drawing 14 (45-D-19411) is representative of the general equipment location only. Actual piping and valve locations shall be the same as the existing locations. All joints between the eductor pneumatic control system and standard steel piping shall have insulated joints. The air filter shall be located so it is readily accessible for maintenance. All valve adjustment screws shall be readily accessible and the pressure gauge shall be located for easy viewing. The air lines, fittings, and pneumatic components shall have a staggered configuration where necessary so that removal of any one component can be accomplished without removing any other component.

(b) Commercial products. -

(aa) Pressure tanks. - The two pressure tanks shall be fabricated in accordance with the requirements of section VIII, division 1, of the ASME Boiler and Pressure Vessel Code and shall have the following salient characteristics:

1. Each tank shall have a minimum volume of 12 gallons and a working pressure of at least 125 pounds per square inch.

2. All welding shall be done in accordance with the requirements of the ASME Code. All welders and welding procedures shall be qualified in accordance with the ASME Code. Certification of tests and results from a testing laboratory approved by the Contracting Officer shall be furnished to the Contracting Officer for record purposes.

3. The finished tanks shall be stamped with the official code symbol. The heads shall be hot formed or spun with surfaces free of wrinkles or buckles and with flanges of smooth, continuous curvatures. Shell plates, before forming, shall be cut accurately to size and shall have edges properly formed to ensure complete penetration of the weld metal.

4. Each tank shall be vertically mounted with a mounting surface for valves and components.

5. All longitudinal and girth butt welds in the air tanks shall be completely radiographed in accordance with the requirements of the ASME Code. Defects in welds shall be repaired in accordance with the requirements of the ASME Code. Portions of welds that have been repaired shall be re-radiographed.

6. All ports and connections for valves, gauges, or other components shall be o-ring flanged-type. Threaded ports will not be allowed.

7. Each tank shall be supplied with a drain valve to drain accumulated water from the tank, a pressure gauge, and a pressure relief valve set to limit pressure in the tank to 125 pounds per square inch.

8. Each tank shall be supplied with an inspection port of sufficient size to visually inspect and clean the interior of the tank.

(bb) Filter. - The filter shall have the following salient characteristics:

1. The filter shall be suitable for removing foreign particles from the air supply. The filter shall be capable of removing particles down to the smallest size required or recommended by the manufacturer of any component used in the pneumatic control system.

(cc) Pilot-operated four-way valve. - The pilot-operated four-way valve shall have the following salient characteristics:

1. The four-way valve shall be suitable for directing air pressure at a maximum of 125 pounds per square inch.

2. The valve shall have 3/8-inch pipe thread ports.

3. The valve shall be pilot-operated using pilot air pressure of from 60 to 120 pounds per square inch with a spring return to the normally closed position.

4. The valve shall direct air pressure to the ball valve operator and return air from the operator and shall reverse the flow when actuated.

5. The valve shall be equipped with a flow control feature which can limit the air flow returning from the ball valve operator.

6. The valve shall be suitable for periodic direct water submergence.

(dd) Pilot-operated two-way valve. - The pilot-operated two-way valve shall have the following salient characteristics:

1. The two-way valve shall be suitable for air pressure at a maximum of 125 pounds per square inch.

2. The valve shall have 3/8-inch pipe thread ports,

3. The valve shall be pilot-operated using pilot air pressure of from 60 to 120 pounds per square inch with a spring return to the normally closed position.

4. With air pressure applied to the pilot port, the valve shall allow free air flow through the valve and shall block air flow by spring return when pilot pressure is released.

5. The valve shall be suitable for periodic direct water submergence.

(ee) Palm button-operated three-way valve. - The palm button-operated three-way valve shall have the following salient characteristics:

1. The three-way valve shall be suitable for air pressure at a maximum of 125 pounds per square inch.

2. The valve shall have 3/8-inch pipe thread ports.

3. The valve shall be suitable for submerged operation.

4. The valve shall be palm button-operated which actuates using a maximum force of four pounds and shall spring return.

5. With the palm button depressed, the valve shall allow free air flow through the valve through the first and second ports with the third port blocked. When the palm button is released, the valve shall re-direct air flow through the first and third port while blocking the second port.

(ff) Shuttle valve. - The shuttle valve shall have the following salient characteristics:

1. The shuttle valve shall be suitable for air pressure at a maximum of 125 pounds per square inch.

2. The valve shall have 3/8-inch pipe thread ports.

3. With pressure applied to the first port of the valve, the valve shall allow free air flow through the valve through the first and third ports with the second port blocked. With pressure applied to the second port of the valve, the valve shall allow free air flow through the valve through the second and third ports with the first port blocked.

(gg) Pressure gauges. - Pressure gauges shall have the following salient characteristics:

1. ASME B40.1, accuracy grade B or better.

2. Bourdon-tube type, liquid filled.

3. 4 to 4-1/2-inch dial. Scale is graduated from 0 to 200 pounds per square inch, figures in intervals of 10 pounds per square inch, and gradations in intervals of 2 or 5 pounds per square inch.

4. Brass cases and brass-wetted parts.

5. Provided with two additional pointers for each gauge: a red pointer set to pounds per square inch and a maximum reading pointer to indicate the highest pressure attained.

(c) Manufacture. -

(aa) General. - The Contractor shall place and secure all equipment and appurtenances either on the air tanks or in a self-contained panel using appropriate brackets and anchors. The location of mounting brackets, tapped holes, and the general layout of the equipment shall suit the particular commercial products furnished. All necessary brackets, bolts, screws, anchors, or other fasteners shall be supplied by the Contractor. The brackets and the assembled pneumatic control system shall have a neat appearance with all exterior corners, welds, and other surface irregularities ground smooth. All brackets and fasteners shall be made of stainless steel.

(bb) Air lines. - All air lines shall be thoroughly cleaned of loose scale and particles by drawing a lint-free cloth, saturated with solvent, through the pipe. Drain the excess solvent from the interior of the air line and dry with a blast of clean dry compressed air, which has been filtered through a dirt and moisture trap. Care shall be taken to keep any foreign matter from entering the air line system during or after fabrication. Special care shall be taken in making air line connections, to remove all burrs and to insure pressure tight connections. The Contractor shall use Dryseal American Standard taper pipe threads where threaded connections are used. Thread compound shall be used sparingly and no thread compound shall be placed on the first full thread nearest the end of the male thread. Do not place thread compound on the female thread. Thread tape will not be permitted.

(cc) Identification nameplates. - Laminated plastic identification nameplates shall be furnished on or near all pneumatic components and valves. The information on each nameplate shall include the component name and the identification symbol, as shown in parenthesis on the pneumatic schematic diagram. All nameplates shall be made in accordance with drawing 21 (40-D-6234) and shall have a letter height of 1/4-inch, except where otherwise noted. The nameplates shall be black with a white core and shall be 1/8-inch thick.

(d) Shop assembly and tests. - Government attendance during shop assembly and testing shall be at the Government's option. The float valve assemblies shall

be fully assembled in the shop and tested to assure that they function properly. The assemblies shall be slowly submerged in a tank of water until the palm button-operated valve actuates. The water level shall be permanently marked on the frame to indicate the water level at which the valve actuates. All required changes, adjustments, correction of defects, and re-testing shall be performed by the Contractor until operation of the pneumatic control system is satisfactory to the Contracting Officer.

(e) Shipping. - After completion of the shop assembly, testing, and adjustments, the complete pneumatic control system shall be crated and shipped assembled with all air line connections sealed against entry of dirt or water. Any movable parts shall be secured to prevent loss or damage by vibration or rough handling or boxed for shipment.

While awaiting shipping, the control system components shall be stored indoors.

(f) Installation. -

(aa) General. - Prior to installation at the site, the Contractor shall store the control system components indoors to protect them from weather and damage.

(bb) Pneumatic control system. - Installation of the pneumatic control system shall include installation of the air tanks, control valves, piping, connection of the air lines from the pneumatically-operated ball valves to the pneumatic control system, connecting to the station air supply, installing air line supports, field operating tests, and cleaning. Air lines cut and installed in the field shall be cleaned in accordance with the requirements above. All required changes, adjustments, correction of defects, and re-testing shall be performed by the Contractor until operation of the control system is satisfactory to the Contracting Officer.

(cc) Pressure testing. - After the control system has been completely installed and the pressure and flow devices have been adjusted, the pneumatic control system shall be pressure tested for leaks using a leak detection fluid. Any leaks shall be repaired and re-tested until no leaks are found.

(dd) Operation diagram. - The Contractor shall attach two plastic-surfaced prints of the pneumatic schematic operating instructions drawing to the wall using appropriate fasteners. The plastic-surfaced prints will be furnished by the Government. At least 90 days before the print is required, the Contractor shall notify the Bureau of Reclamation, Attention: D-8420, PO Box 25007, Denver CO 80225. The notification shall state the date required and the address to which the plastic-surfaced prints should be forwarded.

(g) Testing. - Field testing of the pneumatic control system shall be performed in the presence of the Contracting Officer's representative.

After the control system has been completely installed, it shall be test-operated to demonstrate that the equipment has been installed as required by the specifications. The pneumatic control system shall be fully tested using the station service air supply. Following this test, the pneumatic control system shall be isolated from the station service air supply. The pneumatic air supply tanks shall be tested by fully opening and closing (1 cycle) each pneumatically-operated ball valve three times, for a total of 9 cycles, using the stored air supply. The ball valve and control system shall operate smoothly and quietly without observable vibration, binding or interference.

During the operational tests, the flow control shall be adjusted, if necessary, so that the pneumatically-operated ball valve operates smoothly.

All required changes, adjustments, or correction of defects shall be performed by the Contractor and re-tested by the Government until operation of the control system is satisfactory to the Contracting Officer. Following any required corrections or adjustments, the control system shall be re-tested at the option of the Contracting Officer until operation of the control system, and all appurtenant equipment is satisfactory to the Contracting Officer.

d. Fabrication. - The fabrication of the steel piping shall be in accordance with these specifications and drawings and with the requirements of ASTM A 53 subject to the quality control procedures of AWWA C200.

Flange faces shall be sufficiently true to provide a watertight joint. During the attachment of all flanges to their associated steel piping, the Contractor shall take adequate steps to ensure that the face of the flanges remains flat and perpendicular to the centerline of the attached piping. All initial, residual, or latent irregularities or warping that remain in the face of the flange after its attachment to its steel piping shall then be removed by machining to the extent described below:

Any and all irregularities or warping that remain in the face of all flanges after machining shall be limited to 0.015 inch measured from (1) a high point on the face of the flange at an inside diameter to a corresponding low point on the face of the flange at an outside diameter along any radial line and (2) a high point on the face of the flange along a circumferential line at the centerline of the flange boltholes to a low point on the face of the flange along the same circumferential line within a distance equal to the circumferential distance between every third bolthole.

Concave orientation of the flange face is not permissible. The flange thickness after machining shall not be reduced below the minimum thickness required in the appropriate flange specification.

All joints of flange supports and pipe supports shall be continuously welded so that no cracks will be left that could not be completely painted.

e. Installation. - The piping, valves, and eductors shall be installed to line and grade as shown on the drawings. Welding and testing shall conform to AWWA C206, except testing of the field welds may be performed by the liquid penetrant or magnetic particle method in accordance with the requirements of ANSI/AWS D1.1. The Contractor shall furnish and

install supports and bracing as may be required to hold the piping, valves, and eductors in place and prevent distortion during erection and placing of concrete. The anchor bolts shall be installed in accordance with the manufacturer's instructions.

Field joints not shown on the drawing shall be provided as required to facilitate alinement or installation of the pipe. Field joints shall be flanged. Flanges shall be suitable for the working pressure of the adjacent pipe.

f. Handling and transportation. - During loading, transportation, unloading, storage, and laying, every precaution shall be taken to prevent damage to the piping, valves and eductors.

g. Payment. - Payment for furnishing and installing piping, valves, and eductors will be made at the lump-sum price bid therefor in the schedule.

5.3.2 REPAIR OF VALVES

a. General. - The Contractor shall dismantle, clean, and repair valves located in the Central Section Powerhouse listed below. "Dismantle, clean, and repair" shall include disassembly of the removed valve, cleaning off old coatings and linings, applying new coatings and linings, repairing seats and guides, reassembly of the valves with new gaskets, and if required, with new fasteners, reinstallation of refurbished valves with new flange gaskets required for the new installations, and storage of refurbished valves not being reused in the new installations. The refurbished valves not being reused shall be stored as directed by the Contracting Officer.

(1) 24-inch-diameter galley drain plug valves. - Refer to informational drawing 3 (45-D-4601). There are a total of eight valves located in the Central Section Powerhouse sump galley drain.

(2) 24-inch-diameter "Chapman" gate valves. - The 24-inch-diameter "Chapman" gate valves are designated as "V1" on informational drawing 5 (45-D-14228). There are a total of two valves.

(3) 24-inch-diameter check valves. - The 24-inch-diameter check valves are designated as "V2" on informational drawing 5 (45-D-14228). There are a total of four valves. Two valves are being reused and two are being stored.

(4) 14-inch-diameter check valves. - The 14-inch-diameter check valves are designated as "V1" on informational drawing 4 (45-D-14290). There are a total of two valves.

b. Payment. - Payment for dismantling, cleaning, and repairing valves will be made at the lump-sum price bid therefor in the schedule.

DIVISION 6 - PAINTING

SECTION 6.1 - PAINTING

6.1.1 PAINTING AND COATING, GENERAL

a. General. - The Contractor shall submit all purchase orders, certifications, and samples; furnish all materials; clean surfaces; and apply the approved paint and protective coatings in accordance with this paragraph and paragraphs 6.1.2 (Coating Tabulation) and 6.1.3 (Color Schedule for Painting).

The Contractor shall be responsible for the safe and legal conduct of surface preparation and removing existing coatings, coating application, and disposal of excess coatings materials and removed coatings. All such activities shall be in accordance with applicable Federal, State, and local laws, rules, regulations, codes, and requirements and with these specifications.

(1) Protection of adjacent surfaces and equipment. - Items or surfaces not required to be painted or coated, but which are adjacent to surfaces to be cleaned and coated, shall be protected against contamination and damage during the cleaning and coating operations. This includes surfaces and equipment which are subject to contact by airborne contaminants as well as those which are in physical contact with the areas being cleaned or coated. Examples include: mechanical and electrical equipment (open or enclosed), instruction and similar plates, and wet and newly coated surfaces. Newly coated items shall not be moved until the coating is thoroughly dry. A coating film shall be considered dry through when it cannot be distorted or removed by exerting substantial, but less than maximum, pressure with the thumb and turning the thumb through 90° in the plane of the coating film.

(2) Interior coating of machinery and equipment. - Unless otherwise specified, the Contractor will not be required to disassemble machinery, equipment, or other metalwork for the purpose of coating the interiors.

(3) Damage caused by the Contractor. - Any items or surfaces which are damaged or contaminated by the Contractor's operations shall be returned to their original condition by and at the expense of the Contractor. Before topcoating any coated surfaces, the Contractor shall reclean any exposed surfaces and apply coating material as necessary to restore damaged or defective surfaces to the specified condition. Manufacturer-coated equipment shall be restored to the original appearance of the equipment by appropriate methods.

Temporary or permanent welding for the convenience of the Contractor shall not be done on areas where the welding will damage paint or other protective coatings, unless the areas of coatings which would be damaged thereby are accessible for repairing and inspection.

(4) Safety and health. - The Contractor shall address in its safety and health plan, a program to include exposure monitoring, ventilation requirements, respirator use, work practices, lighting, and the necessary safety equipment for the protection of the workmen; and shall comply with all other applicable safety requirements

during painting and coating operations. See section 2.7 of Reclamation's publication "Reclamation Safety and Health Standards."

All applicable Federal, State, and local requirements, and the manufacturer's recommended safety and health procedures, shall be followed when applying all coatings.

Where operations involve exposure to toxic airborne contaminants or to explosive atmospheres, the Contractor shall provide for the services of an industrial hygienist to formulate a control program and to periodically check its effectiveness. This control program shall be a part of the safety and health plan. Proposed design and engineering controls, i.e., ventilation, filtration, and exhaust systems, shall be approved by the Contracting Officer prior to the acquisition and installation of the equipment. Drawings and design specifications shall accompany the request for approval. The Contractor shall provide approved testing devices for determining concentrations of toxic and flammable gases, fumes, and dusts, and oxygen deficiency.

Employees working in confined areas where high concentrations of toxic substances are present in the atmosphere, but not immediately hazardous to life, shall wear air line respirators or hose masks. Air line respirators or hose masks shall be worn by employees performing blast cleaning, spray painting with toxic coatings, and similar operations. The Contractor shall provide additional air line respirators or hose masks for supervisory personnel and employees providing support for the employees performing the hazardous operations, and one air line respirator or hose mask for the onsite Government inspector. The respiratory devices (air line respirator or hose mask) shall be approved by NIOSH and MSHA for use in the particular conditions created by the work. Air supplied to the respirators shall be clean and free of oil, water, scale, gaseous contaminants, or other extraneous matter. When compressed air is used, an approved-type regulator and suitable inline air purifying absorbent beds and filters shall be inserted in the supply line.

b. Paint and coating materials approval. -

(1) General. - Prior to use or application of materials, the Contractor shall submit to the Government, for approval, copies of purchase orders, certifications, and/or samples of all coatings and related materials, as specified herein. However, acceptance of the material under the clause entitled "Inspection of Construction" will not be made until the material has been satisfactorily applied and the equipment, metalwork, and prepainted and precoated items are installed at the jobsite.

(2) Submittals. - The Contractor shall furnish complete Submittals of paint and coating materials so as to allow the Government not less than 45 days for evaluation prior to use of the associated paint and coating materials.

Purchase orders, required certifications, three copies of all MSDS and related data required in paragraph 1.4.3 (Submission of Material Safety Data Sheets for Hazardous Materials), and other submittals shall be submitted in accordance with this

paragraph and paragraphs 1.1.3 (Submittal Requirements) and 1.4.3 (Submittal of Material Safety Data Sheets (MSDS)).

Each purchase order, certification, and sample shall be identified with the material specifications, the batch or lot represented, the color, the quantity ordered, and the Bureau of Reclamation contract number, coating tabulation number, item identifier by letter and number, and coating option number under which the material is to be used.

The Government will notify the Contractor whether the materials are approved or not approved no later than 45 days from the receipt of the Submittals. If samples which require testing are involved, the notification shall be no later than 45 days after the samples have been received by the testing laboratory.

(a) Purchase orders. - The Contractor shall furnish copies of all purchase orders for coatings and related materials, except thinners. Thinners may be used on the basis of label identification as to the required material or manufacturer's specified product.

(b) Certification. - Manufacturer's certification shall be furnished for all coatings and related materials, except thinners, for each type, batch, lot, and color of material.

The certification shall state that the material is of the same composition as material which previously has been found to comply with these specifications when tested completely, or that the material complies with these specifications based on complete tests which the manufacturer has conducted on the particular batch or lot.

In addition, when the Contractor proposes to use an "or equal" material for any material which is specified by use of a "brand name or equal" purchase description and salient characteristics, submittals shall be in accordance with the requirements above and the requirements of paragraph 1.2.3 (Reference Specifications and Standards) and shall include the following:

(aa) Product data sheet.

(bb) Application data sheet.

(cc) Certifications.

(dd) Certified test reports.

(ee) Material samples and certified testing reports from an independent laboratory, if requested by the Government.

Some coatings or coatings systems are specified using a Government specifications number followed by "or commercial equivalent." A commercial equivalent is a coating or coating system which will perform to or better than

the Government specifications coating on the specified feature and under the specified conditions.

The Contractor shall be responsible for the accuracy of all certifications or data contained therein whether submitted by the Contractor, a manufacturer, a supplier, a subcontractor, or others.

In accordance with the clause entitled "Inspection of Construction," the Government reserves the right to require submittals of samples and to test any material furnished on certification when, in the opinion of the Government, such tests are necessary.

(c) Samples. - In accordance with the following requirements, the Contractor shall furnish samples from the batches or lots to be used, except thinners.

Included with each sample shall be a certification that the sample is from the actual batch or lot to be furnished.

(aa) Liquid and mastic materials. - For atmospheric exposure coatings (categories beginning with a AE or AES), a 1-quart sample shall be furnished of each type, batch, lot, and color of liquid and mastic used in quantities exceeding 20 gallons. The constituents of two-component paints shall be furnished separately and shall include enough material to make a 1-quart sample of the finished product. For immersion coatings (categories beginning with a IE or IES), samples are required only at the request of the Government.

At the option of the Government, samples which have been submitted may be returned to the Contractor or manufacturer after the testing period has been completed.

(d) Submittals and approval of small quantities of coatings. - To obtain approval of a proposed substitution of commercial coatings for certain specified coatings in quantities of 20 gallons or less, as permitted in subparagraph c. below, the Contractor shall identify the items to be coated and submit to the Government the manufacturer's certification stating that the coating will perform to or better than the specified coating in the specified application. When requested by the Government, a 1-quart sample of the coating shall be submitted.

(e) Qualification of coating applicators. - Each coating applicator shall be skilled and experienced in the application of each coating material which they will apply under this contract. The Contractor shall submit written evidence that each coating applicator meets the special standards of responsibility listed below for each coating material they will apply.

Prior to applying any coating material, the Contractor shall furnish for approval for each applicator for each coating material either (aa) or (bb) as follows:

(aa) Data showing that the applicator has successfully completed training in the use of the coating material (including surface preparation; mixing; and application) on applications similar to those specified in these specifications and has obtained certification as a qualified applicator of the coating material from the coating material manufacturer; or

(bb) Data showing that the applicator is skilled and experienced in the application of the coating material under conditions and with materials similar to those specified in these specifications. Data shall include a list of projects (not less than three) where the applicator has successfully applied the coating material, including project name and location; type of structure; owner's name, address, and phone number; application date; and a certification from the manufacturer of the coating material indicating that the coating material was correctly applied.

c. Materials. - Materials shall be in accordance with these specifications and the specifications listed in the coating tabulations in paragraph 6.1.2 (Coating Tabulation). All pigmented coatings and primers shall be purchased in containers not larger than 5 gallons as packaged by the manufacturer unless the Contractor is equipped at the coating site to handle and thoroughly mix coatings which are delivered in larger containers. Containers shall be labeled with the material specification number and the batch number. Colors of finish coatings shall be in accordance with paragraph 6.1.3 (Color Schedule for Painting). All colors and tints shall be prepared by the manufacturer. Tinting at the jobsite shall not be done.

The Contractor shall purchase the total quantity of each construction material that is expected to be used in a reasonable length of time (i.e., 1 year, or the minimum specified storage stability period of the material, whichever is shorter) to avoid repetitive purchases that would impose additional testing expense on the Government. The costs and delays from additional testing required as a result of either unnecessary small purchases or rejection of the materials submitted shall be the responsibility of the Contractor.

Except as specified above regarding colors of finish coatings and certain small quantities of coatings, materials shall be in accordance with these specifications listed in the coating tabulations or may be in accordance with subsequent revisions thereto: Provided, That the samples or certifications are identified with the proper specifications revision.

Where the quantities of each type and color of coating materials listed in the coating tabulations will be 20 gallons or less, the Contractor may propose to substitute similar commercial coatings of the same generic type as the coatings specified herein, subject to approval of the Government. Subparagraph b.(2)(d) above describes the requirements for obtaining approval of the commercial coatings.

Paint and coating materials required to be used on work covered by these specifications, but are not covered by this paragraph or listed in the coating tabulations, shall also be subject to certification, sampling, and testing in accordance with subparagraph b. above.

d. Preparation of surfaces. -

(1) Metalwork and equipment. - Surface preparation shall be in accordance with the methods herein and as indicated in the coating tabulation. Any coatings not required by and not shown in the coating tabulation shall be removed from the surfaces by suitable and effective means, unless otherwise directed. All surfaces not specifically covered herein shall be prepared by methods common to good practice for the particular surface. If rust forms or the surfaces become otherwise contaminated in the interval between cleaning and coating, or between coats, recleaning shall be performed by the Contractor.

(a) Initial surface preparation. - Weld spatter, slag burrs, or other objectionable surface irregularities shall be removed or repaired before cleaning. Any contaminants to the coating, from cleaning operations or other sources, shall be removed before the surfaces are coated.

All oil and grease shall be removed from surfaces to be painted or coated by the use of clean solvent and clean, lint-free wiping material. Cleaning solvent shall be a material which does not leave a residue, such as xylene. Cleaning cloths and solvents shall be discarded before they become contaminated to the extent that a greasy film would remain on the surface being cleaned.

All applicable environmental and safety regulations shall be observed in handling the solvents and disposing of the cleaning cloths and excess solvents.

(b) Specific surface preparation. - Following initial surface preparation, specific surface preparation shall be by one of the following methods, as specified for each item in the coating tabulation:

Method A. - Dirt, scum, and any other contamination shall be removed by solvent cleaning, water washing, or other effective means. The solvent chosen should be one which does not leave a residue. (See sub-paragraph d.(1)(a) above.) Surfaces with gloss or semigloss paints shall also be sanded lightly.

Method A-1. - Surfaces of sound but weathered coatings shall be cleaned by method A. Surfaces displaying residual gloss shall be sanded lightly. At the Contractor's option, and, if appropriate, steam cleaning without additive may be used to remove chalk from surfaces not contaminated with oil or grease.

Method B. - Following the initial surface preparation and solvent cleaning, the surfaces shall be cleaned of all defective or damaged areas of existing paint or coating, and of all loose rust, loose mill scale, and other foreign substances by scraping, chipping, wire brushing, spot abrasive blasting, or other effective means. Spot abrasive blasting shall conform to NACE No. 3 or SSPC-SP6, commercial grade sandblasting.

Method B-1. - Following solvent cleaning to remove oil and grease, the surfaces shall be washed with clean, treated water (no detergent or other additives shall be used). The surfaces shall then be cleaned of all existing paint, and of all loose rust, loose mill scale, and other foreign

substances by commercial grade abrasive blasting conforming to NACE No. 3 or SSPC-SP6. In situations where abrasive blasting is undesirable or impractical, "Power Tool Cleaning to Bare Metal," SSPC-SP11, may be used.

Method C. - Following the initial solvent cleaning, the surfaces shall be blast-cleaned to base metal, using dry, hard, sharp, blasting media, to produce a near-white, abrasive-blasted surface free of all foreign substances to achieve the specified or recommended surface profile. The surface shall be cleaned to conform to NACE No. 2 or SSPC-SP10.

Method C-1. - Following the initial solvent cleaning, the defective or damaged areas of existing paint or coating, and all loose rust, loose mill scale, and other foreign substances on ferrous surfaces shall be spot blast-cleaned to base metal, using dry, hard, sharp, blasting media, to produce a near-white, abrasive-blasted surface free of all foreign substances to achieve the specified or recommended surface profile. The surface shall be cleaned to conform to NACE No. 2 or SSPC-SP10. In situations where abrasive blasting is undesirable or impractical, "Power Tool Cleaning to Bare Metal," SSPC-SP11, may be used. The undamaged surfaces of sound coating surrounding the spot blasted areas shall be feathered out and the sound existing coating to be over coated shall have those surfaces roughened to a SSPC-SP7 condition.

Method G. - After fabrication of stainless steel or stainless-clad steel items, the stainless steel surfaces shall be precleaned, descaled, cleaned, and passivated as recommended in ASTM A 380 to remove all grease, oil, paint, flux, weld spatter, slag, burrs, scale, corrosion products, foreign metals, and other surface contaminants. The cleaning and passivating methods selected shall be consistent with the surface finish specified, the size of the part, and the specific alloy material. The surfaces shall be protected as necessary to preserve the finish until placed into service. Immediately prior to placement in service, all surface protection (wrappings and seals) provided shall be removed and the surfaces recleaned and repassivated to remove all contaminants. If painting or coating of stainless steel surfaces is specified herein, the cleaning and passivating shall immediately precede the coating application.

Method I. - Following the initial solvent cleaning, the surfaces shall be given a brushoff blast cleaning to conform to SSPC-SP7. In circumstances where abrasive blasting is not possible or feasible, power-tool cleaning conforming to SSPC-SP3 or special treatments approved by the coatings manufacturer may be used. In severe exposures only, blast cleaning, conforming to SSPC-SP7, shall be used.

e. Application. -

(1) Qualified applicators. - Coatings shall be applied only by applicators whose qualifications have been submitted and approved in accordance with subparagraph 6.1.1. b.(2)(e) (Qualifications of Coating Applicators).

(2) Materials shall be thoroughly mixed at the time of application. Surfaces shall be clean and, unless otherwise specified, free from moisture at the time of application. Items of metalwork to be coated that are not thoroughly dry at the time of coating application shall be heated to a sufficient temperature (80°F) to drive off any moisture present before paint is applied. Heating, if used, shall be by a method such as the use of space heaters which does not bring products of combustion into contact with surfaces being coated. The surfaces to be coated shall be a minimum of 5°F (3°C) above the dewpoint.

Unless otherwise specified, priming (first) coats shall be applied using the following method:

All boltheads, welds, edges, corners, and similar items shall be primed by brushing to thoroughly and effectively coat these difficult areas. The coating material may be delivered to the surface by spraying and then "scrubbed in" by brushing, providing, that a thorough blowdown, vacuuming, or other dry means of cleaning the blasted surface has adequately removed remaining blasting debris. Flat areas (without difficult areas) may be coated by spraying.

Care shall be exercised during spray application to hold the nozzle sufficiently close to the surfaces being painted to produce a continuous wet coat, and to avoid excessive evaporation of the volatile constituents and loss of material into the air, or bridging over crevices and corners. Effective means shall be provided for removing free oil and moisture from the air-supply lines of all spraying equipment. Spray equipment shall be equipped with mechanical agitators, pressure gauges, and pressure regulators. Nozzle pressure consistent with acceptable finish results shall be employed when spray coating.

Each coat shall be applied in such a manner as to produce an even film of uniform thickness which will completely cover irregularities, fill crevices, and be tightly bonded to the substrate or previous coat. When registers and grilles are being coated, care shall be taken not to clog openings or otherwise excessively coat the surfaces. Each coat shall be free from runs, pinholes, sags, laps, brush marks, voids, and other defects. Each coat shall be allowed to dry or to harden before the succeeding coat is applied.

The thickness on steel surfaces shall be measured by approved gauges and shall be not less than the minimum specified thickness at any point on the coating. Acceptance will be based on specified coverages, or on the specified total dry-film thickness (DFT) as measured by an Elcometer, Mikrotest, or other suitable DFT gauge after the complete coating system has hardened but before the recoating interval has been exceeded.

Nonconductive coating applied to conductive base metals which will be buried or completely or partially submerged in water shall be tested for pinholes and holidays, using the following types of holiday detectors:

(a) For lacquer-type coatings, such as vinyls, a low-voltage wet sponge holiday detector shall be used. Unless otherwise directed by the Contracting Officer, this same type of holiday detector shall be used on other types of coatings with a DFT of less than 16 mils. No detergent shall be used when

making the pinhole and holiday determination with a low-voltage wet sponge holiday detector.

(b) For all coatings between 16 and 20-mil DFT, such as coal-tar epoxies with a DFT of 16 mils or more, and other high-performance coatings (except lacquer types) with DFTs of 16 mils or more, a variable voltage holiday detector shall be used unless otherwise directed by the Contracting Officer. If the use of a low-voltage wet sponge holiday detector is directed, no detergent shall be used.

(c) For all coatings over 20-mil DFT, except lacquer-type coatings, a variable voltage holiday detector shall be used.

(d) Variable voltage holiday detectors shall be adjusted to provide 100 volts per mil of DFT.

Minimum and maximum times for holiday detection and repair of pinholes and holidays shall be in accordance with the coating manufacturer's recommendations and these specifications. The Contractor shall notify the Contracting Officer's representative 72 hours in advance of holiday testing so that the Contracting Officer's representative may witness the pinhole and holiday testing.

As determined by the Contracting Officer, if necessary to improve application properties, cold-applied coatings shall be heated by means of a hot-water bath, or other OSHA-approved method, to temperatures not exceeding 100°F. Unless otherwise specified, coatings shall not be applied when the temperature of the item to be coated or the surrounding air is under 45°F, except that vinyl resin paints shall not be applied when metal or air temperatures are above 110°F or below 40°F. Coating shall proceed only when the humidity and the temperatures of atmosphere and surfaces to be coated are such that evaporation rather than condensation will result. Brush coats may be applied by the conventional brushing procedure, or the coating may be delivered to the surface in a fluid stream by means of spray equipment and the coating then spread immediately by brushing to a smooth, uniform coating.

Thinning of coatings to facilitate satisfactory application shall be kept to a minimum, but in no event shall it exceed 1 pint per gallon of coating, except as otherwise specified; only thinner approved for the type of coating shall be used.

All Contractor-applied coatings exposed to public view shall present a uniform texture and color-matched appearance.

Methods of preparing and applying paints and coatings not included in these specifications shall be in accordance with the manufacturer's instructions and the general requirements of these specifications.

(3) Coating of embedded surfaces. - Unless otherwise specified, coatings on metalwork which is to be partially embedded in concrete shall be extended a minimum of 6 inches along the surface of the embedded metalwork as measured from the face of the concrete.

(4) Application of specific materials shall be as follows:

(a) Priming paints for atmospheric exposure only. - Priming paints shall be applied, unless otherwise specified, at a DFT of not less than 2.0 mil for the first coat. Following the first coat of priming paints, an additional "edge" coat shall be applied over all rivets, welds, bolts, seams, sharp corners, and edges before subsequent painting. The first coat shall be applied by brush or roller, and subsequent coats shall be applied by either brush, roller, or spray, except that priming paints may be applied by spraying when method B surface preparation is specified and the surface is cleaned by "commercial" grade blast cleaning.

* Unless otherwise specified, the DFT is measured above any created profile on the surface, i.e., above the peaks, not the valleys, of the profile.

Coal-tar and petroleum resin or tar epoxy-coated metalwork shall be protected against exposure to direct sunlight until permanent submergence or until installation under cover. Protection may be by covering or shading.

(b) Corrosion-preventive compound. - Corrosion-preventive compound shall be applied by any convenient method to ensure complete coverage with a heavy, uniform coating.

f. Costs. - The cost of furnishing, preparing, and applying all materials for the cleaning, coating repair, or coating operations; and of furnishing and submitting submittals shall be included in the applicable prices bid in the schedule for furnishing and installing the items to be painted or coated or for the items of work which include the work for which the painting and coating is required.

6.1.2 COATING TABULATION

a. General. - Contractor-furnished items shall receive the cleaning, painting, and coating systems shown in the tabulation below. Paint and coatings shall be applied as required under paragraph 6.1.1. (Painting and Coating, General), which paragraph also contains information on required documentation.

All components of a coating system shall be obtained from, or guaranteed by, the same manufacturer. Unless otherwise specified, waterborne and solventborne coatings shall not be used together.

Volatile organic compound (VOC) content of all coatings systems shall not exceed the maximum VOC content permitted by Federal, State, and local air pollution control regulations. VOC content is given for most of the coatings categories and is identified as being either "as supplied" or "reduced for spray." It is the application ("reduced for spray") VOC, not the "as supplied" VOC, which shall not exceed the maximum allowed by the air pollution control regulations. If in doubt as to how much VOC will be increased by various levels of thinning, the Contractor shall consult with the coating manufacturer(s).

In the tabulations under the column headed "Paint or Coating Material," materials are specified by reference to voluntary standards, Federal specifications or standards, "Brand-name or equal" purchase descriptions, or by reference to coatings categories. Coatings categories are classified as:

(1) Coatings categories which describe coatings for immersion, immersion plus exterior exposure, buried service, or constant wetting from condensation, and similar conditions. Requirements for these coatings categories are specified in subparagraph b.(2)(a), below.

(2) Coatings categories which describe coatings for atmospheric exposure, both interior and exterior, and for intermittent condensation. Requirements for these coatings categories are specified in subparagraph b.(2)(b), below.

DFT (dry-film thickness) requirements are given for individual coats where applicable and for the total system under the column headed "Number and thickness of coats."

Where abrasive blasting is specified, the profile to be achieved is the one recommended by the coatings manufacturer(s). The majority of immersion coatings require a profile of 2 to 3 mils. However, a specific profile shall be obtained from the coatings manufacturer(s).

Except as otherwise noted in the tabulations, finish coats of paint shall be of the color and gloss specified in paragraph 6.1.3 (Color Schedule for Painting).

b. Coatings categories. -

(1) General. - Coatings categories have four main sections:

(a) Category number

(b) Composition

(c) Physical characteristics

(d) Coating system performance requirements

When Federal or other specifications are referenced under the coatings categories, "Composition and Physical Characteristics" are combined into one section which references the specification(s).

"Application method" appears in the categories as either an item in the "physical characteristics" section of the category or as a part of a specifications referenced in the category. In instances where the method of application is not specifically mentioned or known from experience, consult the coating manufacturer. If restrictions on site of application, (for example: shop application only) or special applications equipment (for example: plural component, airless spray equipment) is specified in the category, the restrictions shall be observed and the application equipment shall be used.

Reactive, two-package coatings systems (epoxies, polyurethanes, polyesters, and other two-package systems) and reactive single-component, moisture cure, urethanes, have minimum curing temperatures. The reactivity of two-package coatings categories is speeded up with increasing temperatures, leading to shorter pot lives and recoating "windows." These categories have minimum curing temperatures listed. The minimum curing temperatures refer to the temperatures of the surfaces being coated and the requirement that these surfaces are never colder than the specified temperatures. For low temperature curing systems, application to surfaces below 40°F require special precautions against the deposition of "black ice." At temperatures above 100°F, special problems in applying many of the categories may be experienced. Consult the coatings manufacturer when any doubt arises about the suitability of application conditions. Waterborne categories, reactive or not, shall not be applied at a relative humidity of above 85 percent. Unless otherwise specified, conventional, single package, categories of coatings shall not be applied to a surface with a temperature of less than 40°F.

Recoating times at a reference temperature are given in the "physical characteristics" section of the categories or in the specifications referred to in the categories. Some categories show both a minimum and maximum recoating time (a "window"). Others show only the minimum recoating time. Federal Specification coatings shall be checked for recoating times. If recoating times are not listed in the categories or in the Federal Specification, the Contractor shall consult the coatings manufacturer for the recoating time.

(2) Coatings categories classes. - There are two main classes of coatings categories:

(a) Coatings categories which describe coatings for immersion, immersion plus exterior exposure, buried service, or constant wetting from condensation, and similar conditions. These coatings categories have a category identification beginning with an IE or IES.

SUMMARY OF COATINGS SYSTEMS CATEGORIES - IMMERSION EXPOSURE

Category IES-2D - Single-component, moisture cure, aromatic. urethane, zinc basecoat - single-component, moisture cure, aromatic, urethane, refined tar topcoat.

Category IES-7A - Aromatic, single-component, moisture cure, urethane, zinc basecoat - aromatic, single-component, moisture cure, urethane, intermediate coat - aliphatic, single-component, moisture cure, urethane topcoat.

Category IES-2D

Category IES-2D coating system shall be MC-Zinc, primer; MC-Tar, topcoat; as manufactured by:

Wasser High-Tech Coatings
8401 S. 228th, Building. 103
Kent WA 98032
(206) 850-2967,

or equal, having the following salient characteristics:

COMPOSITION:

Primer - Aromatic, single component, moisture-cure, urethane - zinc pigmented containing a minimum of 86 percent, by weight, of zinc in dry film.

Topcoats - Aromatic, single component, moisture-cure, urethane, refined tar - pigmented with micaceous iron oxide at a minimum loading of 3.5 pounds per gallon

Lead and chromate free

PHYSICAL CHARACTERISTICS, PRIMER:	
Volume solids:	60 percent, minimum
VOC (as supplied):	2.8 pounds per gallon (335 grams per liter), maximum
Minimum application temperature:	20°F (Inspector must approve application below 33°F)
Maximum applied DFT per coat:	4 mils
Recoating time at 50 to 90°F and 30 percent RH:	4 hours, minimum (allow more time at humidities of 10-30 percent and temperatures of 20-40°F); 14 day maximum
Application method:	Brush, roller, conventional, or airless spray
Cathodic disbondment:	Is not used with cathodic protection or if cathodic protection will be used in the future.

PHYSICAL CHARACTERISTICS, TOPCOATS:	
Volume solids:	59 percent, minimum
VOC (as supplied):	2.8 pounds per gallon (335 grams per liter), maximum
Minimum application temperature:	20°F (Inspector must approve application below 33°F)
Maximum applied DFT per coat:	10 mils
Recoating time at 40 to 90°F and 30 percent RH:	6 hours, minimum (allow more time at humidities of 10-30 percent and temperatures of 20-40°F); 14- to 21-day maximum
Application method:	Brush, roller, conventional, or airless spray
Cathodic disbondment:	Is not used with cathodic protection or if cathodic protection will be used in the future.
Time before immersion after final coat has been applied at 40 to 90°F and 30 percent RH:	8 hours, minimum (special immersion situations may be permitted after 1 hour)

COATING SYSTEM PERFORMANCE REQUIREMENTS:	
Fresh/Deionized water immersion test: (ASTM D 870)	passes 3,000 hour test with aerated water held at ambient temperatures with no blisters evident on either the scribed or unscribed sides.
Salt water immersion test: (ASTM D 870, ASTM D 1141 formula A with no heavy metals)	passes 3,000 hour test with aerated water held at ambient temperatures with no blisters evident on either the scribed or unscribed sides.
QUV Accelerated weathering test (ASTM D 4587, ASTM G 53)	passes 3,000 hour test with no blisters evident on either the scribed or unscribed sides, minimal chalking (ASTM D 4214)or color difference (ASTM D 2244).
Direct impact resistance (ASTM D 2794):	greater than 150 inch pounds
Flexibility (ASTM D 522, 180° bend over ½-inch mandrel):	passes
Pencil hardness (ASTM D 3363):	2B, minimum
Pulloff Adhesion (ASTM D 4541)(Elcometer)	greater than 500 psi
Tape adhesion (ASTM D 3359)	4A, minimum

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Category IES-7A

Category IES-7A coating system shall be MC-Zinc, primer; MC-Ferrox B, intermediate coat; MC-Ferrox A, topcoat; as manufactured by:

Category IES-7A

Wasser High-Tech Coatings
8401 S. 228th, Building. 103
Kent WA 98032
(206) 850-2967, or ,

or equal, having the following salient characteristics:

COMPOSITION:

Primer - Aromatic, single-component, moisture-cure, urethane - zinc pigmented, containing a minimum of 86 percent, by weight, of zinc in dry film.

Intermediate coat - Aromatic, single-component, moisture-cure, urethane, pigmented portion shall contain micaceous iron oxide at a minimum loading of 3.5 pounds per gallon

Topcoat - Aliphatic, single-component, moisture-cure urethane - pigmented portion must contain micaceous iron oxide at a minimum loading of 3.5 pounds per gallon.

Lead and chromate free

Physical Characteristics, primer:	
Volume solids:	60 percent, minimum
VOC (as supplied):	2.8 pounds per gallon (335 grams per liter), maximum
Minimum application temperature:	20°F (Inspector must approve application below 33°F)
Maximum applied DFT per coat:	4 mils
Recoating time at 50 to 90°F and 30 percent RH:	4 hours, minimum (allow more time at humidities of 10-30 percent and temperatures of 20-40°F); 14 day maximum
Application method:	Brush, roller, conventional, or airless spray
Cathodic disbondment:	Is not used with cathodic protection or if cathodic protection will be used in the future.

PHYSICAL CHARACTERISTICS, INTERMEDIATE COAT:	
Volume solids:	51 to 63 percent, minimum
VOC (as supplied):	2.8 pounds per gallon (335 grams per liter), maximum
Minimum application temperature:	20°F (Inspector must approve application below 33°F)
Maximum applied wet film thickness per coat:	12 mils
Recoating time above 40°F and 50 percent RH:	2 to 4 hours, minimum (allow more time at humidities of 10-30 percent and temperatures of 20-40°F); 7-days maximum
Application method:	Brush, roller, conventional, or airless spray
Cathodic disbondment:	Is not used with cathodic protection or if cathodic protection will be used in the future.
Time before immersion after final coat has been applied at 40 to 90°F and 30 percent RH:	8 hours, minimum (special immersion situations may be permitted after 1 hour)

PHYSICAL CHARACTERISTICS, TOPCOATS:	
Volume solids:	53 to 63 percent, minimum
VOC (as supplied):	2.8 pounds per gallon (335 grams per liter), maximum
Minimum application temperature:	20°F (Inspector must approve application below 33°F)
Maximum applied wet film thickness per coat:	10 mils, wet
Recoating time at 40 to 90°F and 30 percent RH:	6 hours, minimum (allow more time at humidities of 10-30 percent and temperatures of 20-40°F); 7-days maximum
Application method:	Brush, roller, conventional, or airless spray
Cathodic disbondment:	Is not used with cathodic protection or if cathodic protection will be used in the future.
Time before immersion after final coat has been applied at 40 to 90°F and 30 percent RH:	8 hours, minimum (special immersion situations may be permitted after 1 hour)

Category IES-7A	
COATING SYSTEM PERFORMANCE REQUIREMENTS:	
Fresh/Deionized water immersion test: (ASTM D 870)	passes 3,000 hour test with aerated water held at ambient temperatures with no blisters evident on either the scribed or unscribed sides.
Salt water immersion test: (ASTM D 870, ASTM D 1141 formula A with no heavy metals)	passes 3,000 hour test with aerated water held at ambient temperatures with no blisters evident on either the scribed or unscribed sides.
QUV Accelerated weathering test (ASTM D 4587, ASTM G 53):	passes 3,000 hour test with no blisters evident on either the scribed or unscribed sides, minimal chalking (ASTM D 4214)or color difference (ASTM D 2244).
Direct impact resistance (ASTM D 2794):	greater than 150 inch pounds
Flexibility (ASTM D 522, 180° bend over ½-inch mandrel):	passes
Pencil hardness (ASTM D 3363):	2B, minimum
Pulloff Adhesion (ASTM D 4541) w/(Elcometer):	greater than 500 psi
Tape adhesion (ASTM D 3359)	4A, minimum

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Category IE-1D

Category IE-1D coating system shall be Bar-Rust 236; as manufactured by:

Devoe Coatings
4000 Dupont Circle
Louisville KY 40207
(502) 897-9861

or equal, having the following salient characteristics:

COMPOSITION:

Self-priming, two-component, amine, adduct-cured epoxy

PHYSICAL CHARACTERISTICS:

Volume solids:	80 percent, minimum
VOC (as supplied):	1.41 pounds per gallon, (170 grams per liter), maximum
Minimum curing temperature:	0°F*
Mixed usable pot life at 70°F:	4 hours, minimum
Induction time at 77°F:	15 minutes, maximum
Recoating time at 70°F:	3 hours, minimum; 1 month maximum
Mixing ratio:	4 to 1, by volume
Application method:	Brush or roller (small areas only); conventional, or heavy-duty airless spray (preferred)
Time before immersion after the final coat has been applied at 70°F:	7 days, minimum

COATING SYSTEM PERFORMANCE REQUIREMENTS:

Fresh/Deionized water immersion test: (ASTM D 870)	passes 3,000 hour test with aerated water held at ambient temperatures with no blisters evident on either the scribed or unscribed sides.
Salt water immersion test: (ASTM D 870, ASTM D 1141 formula A with no heavy metals)	passes 3,000 hour test with aerated water held at ambient temperatures with no blisters evident on either the scribed or unscribed sides.
QUV Accelerated weathering test (ASTM D 4587, ASTM G 53)	passes 3,000 hour test with no blisters evident on either the scribed or unscribed sides, minimal chalking (ASTM D 4214)or color difference (ASTM D 2244).
Flexibility: (ASTM D 522, 180° bend over 1-inch mandrel):	passes
Pencil hardness (ASTM D 3363):	2B, minimum
Pulloff Adhesion (ASTM D 4541) (Elcometer)	greater than 500 psi
Tape adhesion (ASTM D 3359)	4A, minimum
Cathodic disbondment: (Applicable tests includes but are not limited to: ASTM G 8, ASTM G 42, ASTM G 95)	Has passed a recognized standard cathodic disbondment test.

* Exceptional precautions are required when the surface temperature is below 40°F.

Category C-IE-1DT is the weathering topcoat for this epoxy system, if one is specified.

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Category IE-W2

Category IE-W2 primer coatings shall be:

MC-Miozinc, as manufactured and distributed by: OR Corothane I - Zinc Primer, (B65AQ14), the same product, only distributed under a different product label,

Wasser High-Tech Coatings 8401 S. 228th, Building. 103 Kent WA 98032 (206) 850-2967	Sherwin Williams 101 Prospect Avenue, N. W. Cleveland, Ohio 44115 (216) 566-2000

or equal, having the following salient characteristics:

COMPOSITION:	
Aromatic, single-component, moisture cure urethane - zinc and micaceous iron oxide pigmented Lead and chromate free	
PHYSICAL CHARACTERISTICS:	
Volume solids:	62 percent, minimum
VOC (as supplied):	2.8 pounds per gallon (335 grams per liter), maximum
Minimum application temperature:	20°F (Inspector must approve application below 33°F)
Maximum applied DFT per coat:	4 mils
Recoating time at 50 to 90°F and 30 percent RH:	4 hours, minimum
Application method:	Brush, roller, conventional or airless spray
COATING SYSTEM PERFORMANCE REQUIREMENTS:	
Fresh/Deionized water immersion test: (ASTM D 870)	passes 3,000 hour test with aerated water held at ambient temperatures with no blisters evident on either the scribed or unscribed sides.
Salt water immersion test: (ASTM D 870, ASTM D 1141 formula A with no heavy metals)	passes 3,000 hour test with aerated water held at ambient temperatures with no blisters evident on either the scribed or unscribed sides.
QUV Accelerated weathering test (ASTM D 4587, ASTM G 53)	passes 3,000 hour test with no blisters evident on either the scribed or unscribed sides, minimal chalking (ASTM D 4214)or color difference (ASTM D 2244).
Direct impact resistance (ASTM G 14):	greater than 160 inch pounds
Direct impact resistance (ASTM D 2794):	greater than 150 inch pounds
Flexibility (ASTM D 522, 180° bend over 1/4-inch mandrel):	passes
Abrasion resistance (ASTM D 4060, CS-17 wheel, 1,000 cycles, 1 kg, Taber Abrasion)	45 mg loss
Pencil hardness (ASTM D 3363):	2B, minimum
Pulloff Adhesion (ASTM D 4541) (Elcometer):	greater than 500 psi
Tape adhesion (ASTM D 3359):	4A or 4B, minimum

C-IE-W2.396

Category IE-W3

Category IE-W3 coating system shall be MC-Tar, as manufactured by:

MC-Tar, as manufactured and distributed by: Wasser High-Tech Coatings 8401 S. 228th, Building. 103 Kent WA 98032 (206) 850-2967	OR	Corothane I - Coal Tar, (B65BQ11) the same product, only distributed under a different product label, Sherwin Williams 101 Prospect Avenue, N. W. Cleveland, Ohio 44115 (216) 566-2000

or equal, having the following salient characteristics:

COMPOSITION:	
Self-priming, aromatic, single-component, moisture-cure, urethane, refined tar - pigmented with micaceous iron oxide at a minimum loading of 3.5 pounds per gallon Lead and chromate free	
PHYSICAL CHARACTERISTICS:	
Volume solids:	59 percent, minimum
VOC (as supplied):	2.8 pounds per gallon (335 grams per liter), maximum
Minimum application temperature:	20°F (Inspector must approve application below 33°F)
Maximum applied DFT per coat:	10 mils
Recoating time at 40 to 90°F and 30 percent RH:	6 hours, minimum (allow more time at humidities of 10-30 percent and temperatures of 20-40°F); 14- to 21-day maximum
Application method:	Brush, roller, conventional, or airless spray
Time before immersion after final coat has been applied at 40 to 90°F and 30 percent RH:	8 hours, minimum (special immersion situations may be permitted after 1 hour)
COATING SYSTEM PERFORMANCE REQUIREMENTS:	
Fresh/Deionized water immersion test: (ASTM D 870)	passes 3,000 hour test with aerated water held at ambient temperatures with no blisters evident on either the scribed or unscribed sides.
Salt water immersion test: (ASTM D 870, ASTM D 1141 formula A with no heavy metals)	passes 3,000 hour test with aerated water held at ambient temperatures with no blisters evident on either the scribed or unscribed sides.
QUV Accelerated weathering test (ASTM D 4587, ASTM G 53)	passes 3,000 hour test with no blisters evident on either the scribed or unscribed sides, minimal chalking (ASTM D 4214) or color difference (ASTM D 2244).
Direct impact resistance (ASTM G 14):	greater than 140 inch pounds
Direct impact resistance (ASTM D 2794):	greater than 150 inch pounds
Flexibility (ASTM D 522, 180° bend over 1/8-inch mandrel):	passes
Abrasion resistance (ASTM D 4060, CS-17 wheel, 1,000 cycles, 1 kg, Taber Abrasion)	55 mg loss
Pencil hardness (ASTM D 3363):	HB, minimum
Pulloff Adhesion (ASTM D 4541) (Elcometer):	greater than 500 psi
Tape adhesion (ASTM D 3359):	4A, minimum
Cathodic disbondment: (Applicable tests includes but are not limited to: ASTM G 8, ASTM G 42, ASTM G 95)	Has passed a recognized standard cathodic disbondment test, when applied over the specified epoxy base coat.

C-IE-W3.396

Category IE-W4

Category IE-W4 primer or intermediate coating shall be:

MC-Ferrox B, as manufactured and distributed by: Wasser High-Tech Coatings 8401 S. 228th, Building. 103 Kent WA 98032 (206) 850-2967	OR	Corothane I - Ironox B, the same product, only distributed under a different product label, Sherwin Williams 101 Prospect Avenue, N. W. Cleveland, Ohio 44115 (216) 566-2000

or equal, having the following salient characteristics:

Category IE-W4

COMPOSITION:	
Aromatic, single-component, moisture cure urethane - pigmented portion shall contain micaceous iron oxide at a minimum loading of 4 pounds per gallon	
Lead and chromate free	
PHYSICAL CHARACTERISTICS:	
Volume solids:	60 percent, minimum
VOC (as supplied):	2.8 pounds per gallon (335 grams per liter), maximum
Minimum application temperature:	20°F (Inspector must approve application below 33°F)
Maximum applied wet film thickness per coat:	12 mils
Recoating time at 50 to 90°F and 30 percent RH:	2 to 4 hours, minimum (allow more time at humidities of 10-30 percent and temperatures of 20-40°F); 7-days maximum
Application method:	Brush, roller, conventional or airless spray
COATING SYSTEM PERFORMANCE REQUIREMENTS:	
Fresh/Deionized water immersion test: (ASTM D 870)	passes 3,000 hour test with aerated water held at ambient temperatures with no blisters evident on either the scribed or unscribed sides.
Salt water immersion test: (ASTM D 870, ASTM D 1141 formula A with no heavy metals)	passes 3,000 hour test with aerated water held at ambient temperatures with no blisters evident on either the scribed or unscribed sides.
QUV Accelerated weathering test (ASTM D 4587, ASTM G 53)	passes 3,000 hour test with no blisters evident on either the scribed or unscribed sides, minimal chalking (ASTM D 4214)or color difference (ASTM D 2244).
Cathodic disbondment: (Applicable tests includes but are not limited to: ASTM G 8, ASTM G 42, ASTM G 95)	Has passed a recognized standard cathodic disbondment test.
Direct impact resistance (ASTM D 2794):	greater than 150 inch pounds
Flexibility (ASTM D 522, 180° bend over ½-inch mandrel):	passes
Pencil hardness (ASTM D 3363):	2B, minimum
Pulloff Adhesion (ASTM D 4541)(Elcometer)	greater than 500 psi
Tape adhesion (ASTM D 3359)	4A or 4B, minimum

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Category IE-W5

Category IE-W5 topcoat shall be:

MC-Ferrox A, as manufactured and distributed by: Wasser High-Tech Coatings 8401 S. 228th, Building. 103 Kent WA 98032 (206) 850-2967	OR	Corothane I - Ironox A, the same product, only distributed under a different product label, Sherwin Williams 101 Prospect Avenue, N. W. Cleveland, Ohio 44115 (216) 566-2000

or equal, having the following salient characteristics:

COMPOSITION:

Aliphatic, single-component, moisture-cure urethane - pigmented portion must contain micaceous iron oxide at a minimum loading of 3.5 pounds per gallon.

Lead and chromate free

PHYSICAL CHARACTERISTICS:

Volume solids:	60 percent, minimum
VOC (as supplied):	2.8 pounds per gallon (335 grams per liter), maximum
Minimum application temperature:	20°F (Inspector must approve application below 33°F)
Maximum applied wet film thickness per coat:	10 mils, wet
Recoating time at 40 to 90°F and 30 percent RH:	6 hours, minimum (allow more time at humidities of 10-30 percent and temperatures of 20-40°F); 7-days maximum
Application method:	Brush, roller, conventional or airless spray

COATING SYSTEM PERFORMANCE REQUIREMENTS:

Fresh/Deionized water immersion test: (ASTM D 870)	passes 3,000 hour test with aerated water held at ambient temperatures with no blisters evident on either the scribed or unscribed sides.
Salt water immersion test: (ASTM D 870, ASTM D 1141 formula A with no heavy metals)	passes 3,000 hour test with aerated water held at ambient temperatures with no blisters evident on either the scribed or unscribed sides.
QUV Accelerated weathering test (ASTM D 4587, ASTM G 53)	passes 3,000 hour test with no blisters evident on either the scribed or unscribed sides, minimal chalking (ASTM D 4214)or color difference (ASTM D 2244).
Cathodic disbondment: (Applicable tests includes but are not limited to: ASTM G 8, ASTM G 42, ASTM G 95)	Has passed a recognized standard cathodic disbondment test.
Direct impact resistance (ASTM D 2794):	greater than 150 inch pounds
Flexibility (ASTM D 522, 180° bend over ½-inch mandrel):	passes
Pencil hardness (ASTM D 3363):	2B, minimum
Pulloff Adhesion (ASTM D 4541)(Elcometer)	greater than 500 psi
Tape adhesion (ASTM D 3359)	4A or 4B, minimum

Category IE-W7

Category IE-W7 topcoat shall be:

MC-Aluminum, as manufactured and distributed by: Wasser High-Tech Coatings 8401 S. 228th, Building 103 Kent WA 98032 (206) 850-2967	OR	Corothane I - Aluminum, (B65SQ12), the same product, only distributed under a different product label, Sherwin Williams 101 Prospect Avenue, N. W. Cleveland, Ohio 44115 (216) 566-2000

or equal, having the following salient characteristics:

COMPOSITION:

Aliphatic, single-component, moisture cure urethane
Lead and chromate free

PHYSICAL CHARACTERISTICS:	
Volume solids:	51 percent, minimum
VOC (as supplied):	2.8 pounds per gallon (335 grams per liter), maximum
Minimum application temperature:	20°F (Inspector must approve application below 33°F)
Maximum applied wet film thickness per coat:	8 mils
Recoating time at 50 to 90°F and 30 percent RH:	4 hours, minimum; after 1 days roughen surfaces or do spot adhesion test.
Application method:	Brush, roller, conventional or airless spray
COATING SYSTEM PERFORMANCE REQUIREMENTS:	
Fresh/Deionized water immersion test: (ASTM D 870)	passes 3,000 hour test with aerated water held at ambient temperatures with no blisters evident on either the scribed or unscribed sides.
Salt water immersion test: (ASTM D 870, ASTM D 1141 formula A with no heavy metals)	passes 3,000 hour test with aerated water held at ambient temperatures with no blisters evident on either the scribed or unscribed sides.
QUV Accelerated weathering test (ASTM D 4587, ASTM G 53):	passes 3,000 hour test with no blisters evident on either the scribed or unscribed sides, minimal chalking (ASTM D 4214)or color difference (ASTM D 2244).
Direct impact resistance (ASTM G 14):	greater than 160 inch pounds
Flexibility (ASTM D 522, 180° bend over 1/8-inch mandrel):	passes
Pencil hardness (ASTM D 3363):	2B, minimum
Pulloff Adhesion (ASTM D 4541) (Elcometer):	greater than 500 psi
Tape adhesion (ASTM D 3359):	4A or 4B, minimum

Tabulation No. 1. - The surfaces of the equipment and metalwork items listed below shall be painted or coated in accordance with this tabulation.

Items to be painted or coated:

a. Commercial pneumatic control equipment for the main sump eductors.

Paint or coating materials	Number and thickness of coats	Surface preparation method
Shop coating: Manufacturer's standard permanent coatings system including manufacturer's standard color unless a specific color is otherwise specified in the color schedule or specifications paragraph for the equipment. Field coating: Repair damaged areas of coated surfaces to equal and color match undamaged areas, unless otherwise tabulated herein.		

Tabulation No. 2. - The exterior ferrous surfaces of the items listed below shall be painted or coated in accordance with the requirements of this tabulation.

Items to be painted or coated:

a. The exterior ferrous surfaces of valves, fittings, supports, and piping associated with the eductors above elevation 625.5, as shown on drawing 9 (45-D-19406).

Paint or coating materials, option 1	Number and thickness of coats	Surface preparation method
Base coat: Category: IES-7A (Colors and glosses as shown in the color schedule.)	1 prime coat to produce a DFT between 3 to 4 mils per coat	Method C On succeeding coats follow the manufacturer's specific application instructions and/or specifications for surface preparation.
	1 or more intermediate coats, to produce a minimum DFT of 4 mils per coat.	
	1 or more topcoats, to produce a minimum DFT of 4 mils per coat. For a minimum total DFT of 12 mils	

Paint or coating materials, option 2	Number and thickness of coats	Surface preparation method
Category: IE-1D	2 or more coats to produce a minimum DFT of 16 mils	Method C On succeeding coats follow the manufacturer's specific application instructions and/or specifications for surface preparation.

Tabulation No. 3. - The ferrous surfaces of the items listed below shall be painted or coated in accordance with the requirements of this tabulation.

Items to be painted or coated:

a. Exterior ferrous surfaces of the following items, located below elevation 625.50, as shown on the eductors, Central Section Powerhouse drawings 9 (45-D-19406), 10 (45-D-19407), 11 (45-D-19408), 12 (45-D-19409) and 13 (45-D-19410):

(1) Steel piping, valves, anchors, and supports for the eductors located below elevation 625.50.

Paint or coating materials	Number and thickness of coats	Surface preparation method
Category: IES-2D	1 prime coat to produce a DFT between 3 to 4 mils per coat	Method C On succeeding coats follow the manufacturer's specific application instructions and/or specifications for surface preparation.
	1 or more intermediate coats, to produce a minimum DFT of 6 mils per coat.	
	1 or more topcoats, to produce a minimum DFT of 6 mils per coat. For a minimum total DFT of 16 mils	

Tabulation No. 4 - The ferrous surfaces of miscellaneous metalwork and structural steel items* listed below shall be painted or coated in accordance with the requirements of this tabulation.

Items to be painted or coated:

a. Structural steel support beams for floor slab, Central Section Powerhouse, drawing 18 (45-D-19438).

(1) Beams, plates, and angles.

(2) Wedge plates and shims.

Paint or coating materials, option 1	Number and thickness of coats	Surface preparation method
Category: IES-2D (Color can be either black or bronze)	1 prime coat to produce a DFT between 3 to 4 mils per coat	Method C On succeeding coats follow the manufacturer's specific application instructions and/or specifications for surface preparation.
	1 or more intermediate coats, to produce a minimum DFT of 6 mils per coat.	
	1 or more topcoats, to produce a minimum DFT of 1.5 mils per coat. For a minimum total DFT of 16 mils	

Paint or coating materials, option 2	Number and thickness of coats	Surface preparation method
Category: IES-7A (Colors and glosses as shown in the color schedule)	1 prime coat to produce a DFT between 3 to 4 mils per coat	Method C On succeeding coats follow the manufacturer's specific application instructions and/or specifications for surface preparation.
	1 or more intermediate coats, to produce a minimum DFT of 3 mils per coat.	
	1 or more topcoats, to produce a minimum DFT of 3 mils per coat. For a minimum total DFT of 12 mils	

* Stainless steel items shall not be coated, unless specifically listed elsewhere in these tabulations, or otherwise specified.

Tabulation No. 5 - The damaged areas of galvanized surfaces of the items listed below shall be painted or coated in accordance with the requirements of this tabulation.

Items to be painted or coated:

a. Existing grating in Central Section Powerhouse, as shown on drawing 19 (45-D-19436).

Paint or coating materials, option 1	Number and thickness of coats	Surface preparation method
Prime coat: Category: IE-W2	1 for uncoated surfaces 1 or more coats as required for repair of damaged coated surfaces 3-mil DFT, minimum plus edge coat	Method A - For undamaged coated surfaces to receive additional coatings Method B - For damaged areas of coated surfaces Method I - For galvanized surfaces*
Intermediate coat: Category: IE-W3	1 or more coats 6-mil DFT, minimum, per coat	Method A - For undamaged coated surfaces to receive additional coatings
Finish coats: Category: IE-W7 (For a silver color)	1 or more coats 2-mil DFT, minimum, per coat 11-mil DFT, minimum, for total system, not including edge coat	Method A - For undamaged coated surfaces to receive additional coatings
Paint or coating materials, option 2 (for either immersed, buried, or damp exposure)	**Number and thickness of coats**	**Surface preparation method**
Prime coat: Category: IE-W2	1 for uncoated surfaces 1 or more coats as required for repair of damaged coated surfaces 3-mil DFT, minimum plus edge coat	Method A - For undamaged coated surfaces to receive additional coatings Method C - For damaged areas of coated surfaces Method I - For galvanized surfaces*
Intermediate coats: Category: IE-W4	1 or more coats 3-mil DFT, minimum, per coat	Method A - For undamaged coated surfaces to receive additional coatings
Finish coats: Category: IE-W5	1 or more coats 3-mil DFT, minimum, per coat 9-mil DFT, minimum, for total system, not including edge coat	Method A - For undamaged coated surfaces to receive additional coatings

* Stabilizing or storage treatments, if present on galvanized surfaces, shall be removed by light sandblasting.

Tabulation No. 6 - The stainless steel items listed below shall not be painted or coated.

a. Stainless steel surfaces of:

(1) Pneumatic control system piping, brackets, and appurtenant parts of the eductor pneumatic control system.**

(2) Eductors.

(3) Stainless steel piping for eductors.

Paint or coating materials	Number and thickness of coats	Surface preparation method
Do not paint or coat unless specifically listed elsewhere in these tabulations.		Method G *

* Finish-cleaned materials and components shall not be stored directly on the ground or floor, and should not be permitted, insofar as practicable, to come in contact with asphalt, galvanized or carbon steel, mercury, zinc, lead, brass, low-melting point metals or alloys or compounds of such materials. Removal and Acid cleaning of surfaces that have been in contact with such materials may be necessary to prevent failure of the item.

Minimizing iron contamination. - Iron contamination of stainless steel parts, components and systems is almost always confined to the surface. If reasonable care is taken in fabrication, simple inexpensive cleaning procedures may suffice for its removal, and very little special cleaning should be required. Handling equipment such as slings, hooks, and lift-truck forks should be protected with clean wood, cloth, or plastic buffers to reduce contact with iron or galvanized surfaces. Walking on corrosion-resistant surfaces should be avoided; where unavoidable, personnel should wear clean shoe covers. Hand tools brushes, and other tools and supplies required for fabrication should be segregated from similar items used in the fabrication of carbon steel equipment.

** All exposed surfaces shall be cleaned and passivated in the shop prior to shipment and again in the field after installation; except surfaces to be embedded at final installation need not be repassivated. Do not paint stainless steel surfaces or anchor bolts to be embedded in concrete.

6.1.3 COLOR SCHEDULE FOR PAINTING

The colors and gloss of finish coats of paints shall be in accordance with schedule 6A (Color Schedule).

** NOTE (Use one or the other of the following two paragraphs depending on whether the color schedule is based on Munsell or Federal Standard No. 595 colors)

**The numbers (alphanumeric) in the "Color Number" column of the schedule refer to the Munsell system of color notation referenced in the "Munsell Book of Color," published by Macbeth Division of Kollmorgen Instruments Corporation, 405 Little Britain Road, New Windsor, NY 12553, telephone: (914) 565-7660. Individual color chips for each color number may be purchased from Macbeth.

**The 5-digit numbers in the "Color number" column of the schedule refer to the 5-digit numbering system as specified in Federal Standard No. 595, as amended, for identifying color and gloss. Where the first digit of a color number in the color schedule indicates a gloss different from that specified in the "Gloss" column, the gloss specified in the "Gloss" column shall govern.

If an item is required to be painted but is not listed in the color schedule, the color or colors to be used will be selected by the Contracting Officer from the colors listed in the color schedule, unless otherwise provided for in the coating tabulations in paragraph 6.1.2 (Coating Tabulation).

It shall be the Contractor's responsibility to ensure that a true match of color and gloss is obtained for all painted surfaces of items required by these specifications to have the same color and gloss.

Gloss abbreviations:

G - Full Gloss
SG - Semigloss
ES - Eggshell
L - Lusterless
F - Flat

Numbers listed in the "Tabulation No." column of the color schedule refer to corresponding item numbers of items to be painted listed in the coating tabulations in paragraph 6.1.2 (Coating Tabulations).

Schedule 6A. - Color schedule

Tabulation Item No.	Item Surface	Color	Color No.	Gloss
2	a	yellow	*	*
3	a	yellow	*	*
	b	black or bronze	*	*
4	a	black	*	*

* The contractor shall submit color and gloss to the Contracting Officer's Representative for approval. Refer to Table 1A in Division 1, RSN No. RSC1.

DIVISION 7 - DRAWINGS

SECTION 7.1 - DRAWINGS

7.1.1 DRAWINGS, GENERAL

a. General. - Some of the drawings included herein show details of fabrication, and other details and specifications not a part of work required under these specifications. Specifications and details shown on these drawings which are not applicable under these specifications shall be disregarded. Reference drawings referred to on specifications drawings, and not included herein, are not considered necessary for bidding purposes but will be furnished to the Contractor, where necessary, for construction purposes.) Where details shown on standard drawings 40-D- and 104-D- series differ from those shown on other drawings or the requirements of these specifications, the details shown on other drawings or the requirements of these specifications shall govern.

In accordance with the clause entitled "Specifications and Drawings for Construction," the Contractor shall advise the Contracting Officer of any discrepancies including errors or omissions discovered on any of the drawings.

b. Additional or revised drawings. - Except as otherwise provided in these specifications for drawings to be furnished by the Contractor, these specifications drawings will be supplemented by such additional or revised general and detail drawings as may be necessary or desirable as the work progresses; and the Contractor shall do no work without proper drawings and instructions. The additional or revised general and detail drawings furnished by the Government will show dimensions and details necessary for construction purposes more completely than are shown on these specifications drawings for all features of the work.

c. Additional copies of drawings. - The Contractor will be furnished such additional copies of these specifications and drawings as may be required for carrying out the work. Full-size prints of the original drawings from which the attached reproductions were made, other than standard drawings 40-D- and 104-D- series, will be furnished to the Contractor for construction purposes upon request. Additional prints of the standard drawings 40-D- and 104-D- series of the size included herein (approximately half-size) will be furnished upon request. The number of full-size prints of each drawing furnished to the Contractor will be limited to 10 prints and 1 reproducible.

d. Informational drawings. - Some of the drawings included herein are marked for "information only" in the drawing list, and are intended to show some feature about which additional knowledge is required for bidding and design. Dimensions have not bee checked or compared with actual figures to verify accuracy. To the extent that correct information is required for a bidder to determine a bid price, bidders are advised to verify accuracy and are required to measure for themselves.

e. Mailing address. - All drawings and data submitted by the Contractor for which a specific mailing address is not given in these specifications shall be submitted to the Construction Engineer at the address listed in subparagraph 1.1.3.e (Submittal Requirements).

7.1.2 LIST OF DRAWINGS

The following drawings are made a part of these specifications:

Hoover Powerplant
Boulder Canyon Project
Arizona and Nevada

Location Map:

1. 45-301-6681 - Location Map

General plan:

2. 45-D-19455 - General Plan

Central Section Powerhouse:

3. 45-D-4601 - Central Portion - Plan at Elev. 620+ - Floor Elev. 616.0
4. 45-D-14290 - Central Portion Location C2-C3 - Supply and Control Piping for 24-inch Jet Pumps
5. 45-D-14228 - Central Portion - Location C2-C3 - Piping Details - 24" Jet Pumps for Main Sump - Supply and Discharge Lines
6. 45-D-8463 - Piping - Details - 3" x 6" Eductor Piping - Main Sump - Central Portion
7. 45-D-8462 - Piping Details - Tail Pipes and Float Chambers in Main Sumps - Central Portions
8. 45-D-14242 - Central Portion - Location C2-C3 - Structural Steel - Floor Slab Reinforcement - Assembly - Details
9. 45-D-19406. - Piping, Valves, and Eductors - Plan, Sections, and Detail
10. 45-D-19407. - Piping, Valves, and Eductors - Sections and Details
11. 45-D-19408. - Piping, Valves, and Eductors - Plan and Sections
12. 45-D-19409. - Piping, Valves, and Eductors - Sections and Details
13. 45-D-19410. - Piping, Valves, and Eductors - Anchors
14. 45-D-19411. - Piping, Valves, and Eductors - Eductor Operating Conditions
15. 45-D-19412. - Eductor Controls - Pneumatic Schematic Diagram
16. 45-D-19413. - Eductor Controls - Installation - List of Parts - Detailed Parts
17. 45-D-19414. - Piping Details - Tail Pipes in Main Sump - Central Portions
18. 45-D-19438. - Central Portion - Location C-2 and C-3 - Structural Steel - Support Beams for Floor Slab

Miscellaneous Metalwork:

19. 45-D-19436 - Miscellaneous Metalwork - Gratings and Covers

Standard Drawings

20. 40-D-4335 - Electrical Standards - Typical Grounding Details - Sheet 2
21. 40-D-6234 - Standard Nameplates
22. 40-D-6248 - Flange Support

7.1.3 DRAWING NUMBERS IN NUMERICAL ORDER

Drawing	Sheet No.
45-D-	
45-D-4601	3
45-D-8462	7
45-D-8463	6
45-D-14228	5
45-D-14242	8
45-D-14290	4
45-D-19406	9
45-D-19407	10
45-D-19408	11
45-D-19409	12
45-D-19410	13
45-D-19411	14
45-D-19412	15
45-D-19413	16
45-D-19414	17
45-D-19436	19
45-D-19438	18
45-D-19455	2
45-301	
45-301-6681	1
40-D-	
40-D-4335	20
40-D-6234	21
40-D-6248	22